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ORIGINAL COMMUNICATIONS.

ART. XXIX.—ON ASARUM CANADENSE. By Richard Rushton.

This plant has been placed in the secondary list of the United States Pharmacopœia, and has, for a long time, been ranked among those contributing to the Materia Medica of our country. It appears to have been one of the first known American productions, as Willdenow, in his description of it, refers to Gronovius and Morrison, while Pursh refers to Walter. On account of its medical properties, it has been noticed by all the writers who have directed attention to the subject of native medicines.

Asarum canadense belongs to the class Gynandria; order Dodecandria, L., to which it was referred upon a revision of the Linnæan system; it had previously been ranged in the class Dodecandria, which has been dispensed with. The natural family to which it is united is the Aristolochiæ.

Generic characters.—Calyx campanulate, three or four-cleft; corolla none; anthers adnate to the middle of the filaments; capsule inferior, six-celled, crowned with the calyx.—Nuttall.

Specific description.—The root of the *Asarum canadense* is creeping, fleshy, and somewhat jointed; leaves kidney-shaped, pubescent on both sides, with long, round,

hairy petioles; flower solitary, growing from the fork of the stem on a pendulous hairy peduncle. Calyx very hairy or woolly, consisting of three broad concave leaflets, which are mostly of a brownish or dull purple on the inside, at top and bottom, and terminated by a long spreading inflected point, with reflexed sides. The color varies greatly according to the amount of light which the plant enjoys, being sometimes nearly green. Stamens twelve, inserted on the germ at a distance from the calyx; the alternate ones longer. Anthers growing to the filaments below their extremity. Near the divisions of the calyx are three short, curved, filamentary substances, which may, perhaps, be called nectaries. Germ inferior, somewhat hexagonal, marked at top, inside, with a dark red line; style conical, striate, parted at top into six-recurved, radiating stigmas.—BIGELOW.

Synonyms.—Asarum latifolium, SALISB.; *Asarum foliis* sub-cordatis petiolatis, GRONOVIUS; *Asarum Carolinianum*, WALT.

The popular names by which it is known are, wild ginger, Indian ginger, coltsfoot, Canada snake-root, American asarabacca, and kidney-leaved asarabacca.

Habitat.—This plant has been found in all parts of this country, from Canada to Carolina, usually in low rich woods where the soil is moist, and sometimes on the sides of shady mountains; in such localities it attains its extreme size, and possesses in the highest degree the characters for which it is remarkable. The time of flowering is during the first warm months.

The root alone affords the officinal drug which is known by the title "Asarum," U. S. It is prepared by removal from the ground during the summer, washing off the earthy particles, and then drying by exposure in the shade. By this process the radicles, from their delicacy, are separated. When fresh, these last, as well as the body of the root, are of a yellowish color.

As found in the shops, it appears in the form of long, more or less contorted pieces, about the thickness of a straw, or

even larger; the external covering is brownish and wrinkled, the internal substance is white, hard, and brittle. Occasionally short fragments of radicles are attached. It comes either in mass, or in square packages, derived from the Shakers; when under the last form, the leaves are usually attached, and then it is liable to the objection common to all the articles obtained from this source, viz., the tendency to mouldiness from the necessity of putting them up when but partially dry, in order to give to the packages their degree of compactness by pressure.

The taste is agreeably aromatic and slightly bitter, being of a mixed character. The smell is aromatic, but less so in the dry than in the fresh state. All portions of the plant partake, more or less, of these properties.

MEDICAL HISTORY.

Wild ginger is spoken of by CORNUTUS as affording a grateful potion, when the roots are steeped in wine. LEMERY, in his *Dictionnaire Universel des Drogues Simples*, alludes its substitution for ginger by the aborigines of America; his work was published in 1733. Dr. BENJAMIN SMITH BARTON, in his *Collections* states, but whether from his own experience we are not informed, that the expressed juice of the leaves is emetic, and that likewise the leaves themselves are errhine. We are chiefly indebted to Drs. BIGELOW and WILLIAM P. C. BARTON for the more full elucidation of the medical properties of this plant.

MEDICAL PROPERTIES.

In these, like its congeners, it is stimulant and tonic, as would at once be evident, not only from the sensible properties of the root, but from the knowledge we now possess as regards its ingredients. Of course, like all other articles of the same class, the effects upon the animal economy must vary according to the mode of exhibition. Thus its sudorific power will be manifested by exhibition in warm effusion, and perhaps, in large quantities it will, in this form, prove emetic;

in cold infusion or tincture, it is cordially stimulating and tonic to the stomach. In substance the same invigorating effect is produced. As regards the emetic property attributed to the expressed juice of the fresh leaves, it would appear, from the investigations of the two last mentioned authors, that some error has been committed in making the assertion; and, if such an effect be produced, other circumstances are to be taken into consideration.

CHEMICAL HISTORY.

With the view of ascertaining the nature of the ingredients contained in the root of the *Asarum canadense*, upon which its medical properties depend, I have been induced to perform the following experiments. After having presented them in detail with the results, I shall draw the analogy between my own investigations and those which have preceded them; and although this field of research has been explored, I conceive that where the attainment of exact information is the end in view, there cannot be a too frequent repetition of the endeavor to render it as certain as possible.

Experiment 1.—To a saturated decoction of the powdered root and leaves, a solution of sub-acetate of lead was added until it ceased to afford a precipitate. This precipitate was of a dirty white color, and when dried presented all the characters of the compound of gum and oxide of lead (of BERZELIUS.*)

Experiment 2.—To a saturated decoction previously decolorized by animal charcoal, tincture of iodine was added, which turned it to a beautiful purplish-blue color.

Experiment 3.—One ounce of the root was digested in four ounces of absolute alcohol, until exhausted, then filtered and evaporated one half. To this, water was added, which produced an abundant whitish precipitate, which, when dried, was of a dark brown color, transparent, and possessed the taste and odor of the plant.

* *Turner's Chemistry*, page 506.

Experiment 4.—One ounce of the powdered root was macerated for five days in four ounces of sulphuric ether of 60° Baumè, when it was filtered and evaporated, a dark green oily matter was obtained. This was digested in absolute alcohol, which dissolved part and deprived it of the green color. The residue was a fatty substance, which left a greasy stain on paper, and possessed something of the character of wax. By mixing the fatty substance with caustic potassa, in solution, a soapy compound was generated. The alcoholic solution of the ethereal extract, evaporated, yielded a greenish greasy matter, having the taste of the plant, and which was chlorophylle, resin, and fixed oil.

Experiment 5.—Four ounces of the powdered root and leaves were introduced into a glass retort with one quart of water, to which a receiver was adapted. Heat was then applied, until three-fourths of the water had passed over, accompanied with a small quantity of volatile oil. After the removal of the oil, the water was returned into the retort on another quantity of the root, and the process continued until three-fourths of a pound was consumed. From this quantity of the dry root, one drachm of essential oil was obtained, which possesses the following characters:

It has a light greenish-yellow color, a warm, pungent, slightly bitterish, aromatic taste, and contains all the virtues of the plant. Soluble in all proportions in alcohol and ether, very slightly soluble in water, to which it imparts, in a slight degree, its odor and taste. When inflamed it burns with a very bright flame, and does not congeal at the temperature of freezing. It has a specific gravity of .9452. Sulphuric acid converts it into a resin of a reddish-brown color. A portion of the plant was subjected to destructive distillation, and an empyreumatic oil obtained having a black color, and a bitterish, somewhat aromatic taste, and a disagreeable odor, soluble in alcohol and ether, and burning with a bright flame and much smoke.

Experiment 6.—Incinerated 1000 grains of the root and leaves of wild ginger, which yielded one hundred and twenty-

six grains of ashes. These were lixiviated in boiling water, and the liquor evaporated to dryness; it yielded about fifty-seven grains of a grayish matter which restored the color of litmus reddened by an acid, effervesced with acids, and had a strong caustic alkaline taste. This was dissolved in water, and saturated with nitric acid, which, when evaporated, deposited crystals, which had all the characters of nitrate of potassa.

Experiment 7.—The insoluble residue of experiment six was acted on with nitric acid, and the nitric solution diluted and filtered. This solution afforded an abundant white precipitate with oxalate of ammonia, and a solution of ferrocyanate of potassa produced a blue color, giving evidence of the presence of lime and iron.

Experiment 8.—One ounce of the plant was digested with twelve ounces of absolute alcohol for three days, in a water bath, and one ounce digested with the same quantity of water, the same length of time, at the same temperature, both the liquors filtered and evaporated to the consistence of extracts, the alcoholic solution yielded sixty-two, and the watery seventy-five grains of extract. The alcoholic extract possessed the odor and taste of the plant in a very high degree. The watery extract possessed little of the taste or smell of the plant. Then the portion which had been exhausted by water was digested with absolute alcohol, and that exhausted by alcohol digested with water for three days in a water bath, the solutions filtered and evaporated, the resulting extracts were similar to those first obtained. The alcoholic possessing all the virtues of the plant, and the watery almost tasteless and without smell.

From these experiments it may be inferred that the principal constituents of the *Asarum canadense* are—1st, gum; 2d, starch; 3d, resin; 4th, fatty matter; 5th, chlorophylle; 6th, *volatile oil*, upon which the sensible properties of the plant depend; 7th, salts of lime and potassa; 8th, iron; to which may be added *lignin*.

Upon comparing the above results with those obtained by Dr. Bigelow, it will be found that the same proximate prin-

ciples have been developed, with the addition, from my own experiments of *fatty matter*, chlorophylle, salts of lime and potassa, iron, and lignin.

AFFINITIES.

The close alliance between the *Asarum canadense* and other individuals composing the same family, is apparent, not only from the similarity of botanical characteristics, but also from the now ascertained chemical constitution of the most prominent among them. It is not at present necessary to point out the botanical affinities, as the description that has been given includes most of the peculiar attributes of the family Aristolochiæ; indeed, although the species of the genus Aristolochia have been selected as affording the types, they might as well have been furnished by those of the genus Asarum. Of this, there are several species in the United States, besides the one under consideration, the properties of which, from analogy, may be inferred to have a close resemblance; these are *A. virginicum*, the roots of which, it is stated, were formerly mixed with *Serpentaria*, and *A. arifolium*. But the congener with which it is most frequently compared, is the European species, *A. Europæum*. Guibourt, in his *Hist. Abrégée des Drogues Simples*, 3d edition, states "that the root sent to him from Philadelphia, by Mr. Durand, did not seem to him to differ from that of the *Asarum Europæum*." From this resemblance several botanists have been induced to suppose that they were only varieties of the same, which, however, is not the case. If there be, upon fair comparative trial, the slight difference in medical properties that has been supposed, may it not be attributed rather to the degree or amount of the active proximate principle, than to the existence of a principle in one which is not to be found in the other? Thus the essential oil would seem to be the most energetic element of both, and the greater emetic power ascribed to the Asaret of Europe, may depend upon its presence in larger proportion.

PHARMACEUTICAL USES.

Hitherto no preparations of the *Asarum canadense* have been made officinal; it yields its properties to water and alcohol, the latter, however, for obvious reasons, being the best vehicle; it is sometimes used in substance. If water be employed to extract the virtues, the precautions with regard to the degree and mode of applying heat ought to be attended to, as in the case of substances containing volatile matter. A decoction or an extract would seem to be precluded. The suggestion of the United States' Dispensatory appears worthy of attention, "that it would form an elegant adjuvant to tonic infusions and decoctions." In the latter instance, of course, it could not properly be added until the heat had been diminished.

ART. XXX.—OBSERVATIONS ON AMYGDALINE, DEMONSTRATIVE OF ITS EXISTENCE IN SEVERAL SPECIES OF THE NATURAL DIVISION OF PLANTS AMYGDALEÆ.

By William Procter, Jr.

Few facts in organic chemistry are more calculated to elicit our admiration than the existence of a powerful proximate principle in an extensive range of plants, many of which differ exceedingly in external characters, although they belong to the same genus. Such an instance is *Amygdaline*, a substance discovered in the bitter almond by Robiquet and Boutron Charlard,* and which has since been ascertained by Liebig and Wohler to be the principle that gives rise to the oil of bitter almonds, (hyduret of benzule,) and hydrocyanic acid, obtained by the distillation of these almonds with water.

* *Annal. de Chimie et de Phys.*, tome xliv.

Robiquet and Boutron Charlard have proved that the volatile oil and acid, just noticed, do not exist in the bitter almonds before treatment by water, and have confirmed the anterior researches of M. Planche and MM. Henry and Guibourt.

Bitter almonds, moistened and distilled after exhaustion by ether, give the same quantity of volatile oil as before; hence it may be reasonably concluded that the materials which give rise to the oil, and all the conditions necessary to its formation, exist in the exhausted almonds in the same state as if they had not been treated by ether. But if the almonds be exhausted by boiling absolute alcohol, either before or after the ethereal treatment, all indications of the volatile oil and hydrocyanic acid disappear in the residue. Moistened with water it remains inodorous, and, distilled with that fluid, it does not yield volatile oil. But the hot alcoholic solution deposits white crystals by cooling, and still more by concentration, and this crystalline matter is *amygdaline.*

Amygdaline is readily soluble in water and boiling alcohol, but is insoluble in ether. It has a white color, pearly lustre, and bitter taste. Treated with nitric acid, it yields volatile oil of bitter almonds and benzoic acid, and when heated with the fixed alkalies it disengages ammonia; hence we may conclude that it contains nitrogen. The transparency of a solution of amygdaline is a test of its purity, as a very small portion of fixed oil (of which it is very difficult to rid it) communicates an opalescence.

Amygdaline, when placed in contact with water, and the albumen of either sweet or bitter almonds, at a temperature of from 36° to 72° Fahr., is instantly decomposed; and among the products of its decomposition are found hydrocyanic acid and oil of bitter almonds. This albuminous substance in almonds, which has received the name of *emulsine* from Liebig and Wohler, differs from ordinary vegetable albumen, and is soluble in cold water.

Amygdaline pre-exists in the bitter almonds. Let an emulsion of bitter almonds be mixed with a large quantity of

cold alcohol, and the mixture filtered. The solution, by being heated to ebullition and again filtered, yields crystallized amygdaline by spontaneous evaporation.

A saturated aqueous solution of amygdaline, made at 104° Fahr., deposits, by cooling, a large quantity of transparent crystals, which radiate, in crystallizing from a common centre, in voluminous groups. They are softer than sugar, become opaque by exposure to the atmosphere, and lose all their water of crystallization at an elevated temperature, in order to effect which it is necessary to expose them to a sustained heat of 248° Fahr.

It appears, according to LIEBIG and WOHLER's statement, that one hundred parts of crystallized amygdaline is composed of—

Amygdaline,	89.43
Water,	10.57
	100.00.

Composition of Amygdaline.

Many difficulties present themselves in the analysis of amygdaline, particularly that of depriving it wholly of water of crystallization, as it absorbs rapidly from two to three and a half per cent. of water. All substances that contain azote offer great opposition to exact analysis, from the impossibility of depriving the apparatus of atmospheric air. The following table represents the results of five careful analyses by LIEBIG and WOHLER, in which they have taken every possible precaution respecting the azote:

	I.	II.	III.	IV.	V.
Nitrogen,	3.069	3.069	3.069	3.069	3.069.
Carbon,	51.874	52.760	52.770	52.827	52.810.
Hydrogen,	6.166	5.980	6.036	5.900	5.942.
Oxygen,	38.891	38.201	37.125	38.204	38.179.

Whence they deduce the following theoretic composition, viz.:

2	atoms	nitrogen,	177.036 =	3.069.
40	"	carbon,	3057.480 =	52.974.
54	"	hydrogen,	336.949 =	5.838.
22	"	oxygen,	2200.000 =	38.119.
1	"	amygdaline,	5771.465 =	100.000.

If crystallized amygdaline is placed over sulphuric acid for eighteen hours, it loses 3.521 per cent., whilst its transparency is diminished; this loss corresponds with two atoms of water. Crystallized in absolute alcohol, it retains that fluid in chemical combination, from which it is readily separated by heat. But when it is crystallized in alcohol of eighty to eighty-one per cent., like that dried over sulphuric acid, it contains four atoms of water.

Amygdalic Acid.

When amygdaline is heated with a fixed alkali it disengages ammonia, and the alkali is found in saline combination with a peculiar product, which has received the title of *amygdalic acid.*

Amygdaline dissolves in cold baryta water without decomposition. If heated, it developes, by ebullition in a close vessel, pure ammonia and no other product. If it be boiled in contact with the atmosphere, a precipitate of carbonate of baryta is formed by the action of its carbonic acid. By continuing the ebullition fifteen minutes, the decomposition is ended, and all signs of the disengagement of ammonia disappear. Then, by passing a current of carbonic acid through the solution, the excess of baryta is precipitated, and after filtration a perfectly neutral solution of *amygdalate of baryta* remains.

This salt cannot be obtained in a regular form, for, by evaporation, its solution yields a gummy mass, which, when exposed to a temperature of 352° Fahr., becomes whitish and

porcelainous, and can be reduced to a powder, which rapidly absorbs from four to seven per cent. of water.

According to several accurate analyses of the amygdalate of baryta, in which every precaution was taken respecting the hygrometric humidity in the apparatus, arising from the tenacity with which the salt holds water in combination, the following is offered by LIEBIG and WOHLER as its composition, viz.:

40 atoms	carbon,	3057.480 =	45.519	in 100 parts.	45.335	found.
52 "	hydrogen,	324.469 =	4.814		5.029	
24 "	oxygen,	2400.000 =	35.466		36.458	
1 "	baryta,	956.880 =	14.199		13.178	
1 "	amyg. bar.	6738.829.				

Amygdalic acid can easily be obtained by precipitating its barytic salt with dilute sulphuric acid. It is a weakly acid liquid, which becomes syrupy, and finally a gummy mass on evaporation by a salt bath.

It absorbs moisture from the air with avidity, and deliquesces; it is insoluble in either cold or boiling *absolute* alcohol and ether, but is slightly soluble in hydrated alcohol.

When boiled with peroxide of manganese, and a little sulphuric acid, it yields, by distillation, formic and carbonic acids, and oil of bitter almonds. The production of the last is an evidence of its existence ready formed in amygdalic acid.

All the amygdalates undergo the same decomposition, and none, so far as LIEBIG and WOHLER had examined, were insoluble but the amygdalate of lead.

The composition of amygdaline, and that of amygdalic acid, are reciprocally confirmed. Amygdalic acid contains two atoms of hydrogen *less*, and two atoms of oxygen *more* than amygdaline; if to the elements of amygdaline, two atoms of water be added, and two atoms of ammonia be taken away, there remains *one* atom of amygdalic acid; thus—

$$N^2C^{40}H^{54}O^{22} + H^4O^2 = N^2C^{40}H^{58}O^{24} - N^2H^6 = C^{40}H^{52}O^{24}.$$

If amygdaline be represented as a combination of hydrocyanic acid, $N^2C^2H^2$, with another body, $C^{38}H^{52}O^{22}$, and if it be admitted that, under the influence of the alkali, hydrocyanic acid, by the concurrence of three atoms of water, be decomposed into ammonia and formic acids, amygdalic acid may be considered as a compound of formic acid, $H^2C^2O^3$, and the body, $C^{38}H^{52}O^{22}$, the combination of the bases separating one atom of water; thus—

$$C^2H^2O^3+C^{38}H^{52}O^{22}=C^{40}H^{54}O^{25}-H^2O=C^{40}H^{52}O^{24}.$$

Action of Emulsine on Amygdaline.

As has been said, if a solution of amygdaline be placed in contact with an emulsion of almonds, the odor of hydrocyanic acid is immediately perceptible, and is much augmented by slightly heating the mixture. When this mixture is tested, the presence of that acid is demonstrated. Emulsine, the active agent in the emulsion of almonds, exists in the bitter almonds also; so that we find this kernel to possess two of the requisites for generating oil of bitter almonds. When the third, water is added, the emulsine of the kernel becomes dissolved, through which it acts immediately on the amygdaline, and the volatile oil and acid are generated just as when the the former is used in an isolated state. To be able to study the action of emulsine with more care, LEIBIG and WOHLER have deprived the almonds of their fixed oil by ether, so that the residue dissolves almost entirely in water, and forms a transparent slightly opaline liquid, which loses its transparency by being heated to 180° F., and at 212° F. becomes a thick coagulum like a solution of starch. This liquid they call *solution of emulsine*, and it acts precisely as an emulsion. It was at first supposed that the quantity of emulsine influenced the amount of amygdaline decomposed, without any reference to the quantity of water; but by experiment it has been found that of two mixtures, in which the amygdaline and emulsine were equal in quantity, that most diluted yielded the largest

amount of volatile oil by distillation; hence the quantity of water has a very important influence.

Coagulated emulsine has no effect on amygdaline.

If boiling water be thrown on pulverized bitter almonds, they yield no trace of volatile oil by distillation, hence the emulsine, as it occurs naturally, is in the fit state to act as the decomposing agent of amygdaline.

Solution of emulsine is precipitated in thick white flocks by alcohol. This precipitate dissolves easily and completely in cold water, even after it has been dried, and its solution acts as emulsine before precipitation.

The products mentioned are not the only ones that result from the decomposition of amygdaline, as is seen by the following experiment of LEIBIG and WOHLER. A solution of precipitated emulsine was put in a warm situation, and then amygdaline was added gradually in small portions until no odor of hydrocyanic acid was perceptible. After having thus added to the emulsine ten times its weight of amygdaline, in the course of eight days all the decomposition ceased. Then by evaporating the liquor by a gentle heat, all its odor completely disappeared; it had a syrupy consistence and a saccharine taste. The quantity of dried residue represented more than four times the amount of emulsine employed. When this syrup was allowed to repose for some time, it deposited small hard crystals which were found to be identical with cane sugar. If a little ferment be added to the residue dissolved in water, it enters into rapid fermentation, and yields alcohol by distillation, which fact places beyond all doubt the formation and separation of sugar.

The small quantity of emulsine which is proportionably necessary to produce the decomposition of amygdaline, bears a certain resemblance to that of ferment on sugar, which BERZELIUS has attributed to a peculiar force—*the catalytic force.*

According to its composition, amygdaline contains the elements of

			N	C	H	O
2	atoms	hydrocyanic acid,	2	2	2	0
2	"	oil of bitter almonds,		28	24	4
1	"	sugar,		6	10	5
2	"	formic acid,		4	4	6
7	"	water,			14	7
1	"	amygdaline,	2	40	54	22*

So far as my knowledge extends, no substance has hitherto been discovered to effect the decomposition of amygdaline, but the albumen of almonds; but the sequel will show that all those seeds which yield amygdaline contain a decomposing principle, acting in every way similar to emulsine and which is probably identical with the albumen of almonds.

The existence of amygdaline in the leaves of the *Prunus laurocerasus*, (cherry laurel,) has been rendered highly probable, and, according to the following observations, the same is true with regard to the bark and leaves of the *Prunus Virginiana.* Hence the question arises, what is the agent of decomposition in these cases? With these preliminary remarks I will observe, that the design of this paper is to demonstrate the existence of amygdaline in several species of the genera, *Prunus*, *Amygdalus*, &c.

As generically connected with the almond, the kernel of the peach (*Amygdalus persica*) will first receive attention.

A quantity of peach kernels were powdered and subjected to the action of ether, until deprived of most of their fixed oil, after which they were treated with boiling absolute alcohol.

* For the substance of the preceding observations on amygdaline we are indebted to the excellent paper of LEIBIG and WOHLER, which appeared originally in the *Annalen der Pharmacié*, and republished in the August number, 1837, of the *Journal de Pharmacié*, whence they were principally extracted. My reason for inserting them here, is because no notice has yet been taken of amygdaline by any of our American Journals—besides, they form a very excellent preface to the succeeding observations.

The alcoholic liquor was then filtered and evaporated, leaving a residue which consisted of a crystalline matter and fixed oil. This residue was again treated with ether to remove the fixed oil, and the undissolved portion redissolved in alcohol.

On evaporating this alcoholic solution, white crystals were obtained, which, when dissolved in a solution of emulsine, emitted a hydrocyanic odor. This mixture, when subjected to distillation, yielded essential oil (hyduret of benzule) and hydrocyanic acid.

When the crystals are boiled with water of potassa, ammonia is evolved, thus proving their identity with amygdaline.

A quantity of the kernels of the nectarine, well dried, were treated with boiling absolute alcohol, and the liquor thus obtained filtered and evaporated to dryness; the residue treated with ether was redissolved in absolute alcohol, and, by evaporating spontaneously, crystals of amygdaline were obtained of a very regular form. The volatile oil of the nectarine has a much nearer resemblance to that of the peach than the preceding, and is yielded in much larger quantity than in the different species of Prunus.

The apricot, *Armeniaca vulgaris*, is a plant bearing an intermediate position in botanical characters as regards the two genera, Amygdalus and Prunus; and we are naturally led to the inference of a similarity in the chemical constitution of its seed.

A portion of the kernels of the apricot, deprived of their investing membrane, and well dried, were subjected to ebullition with absolute alcohol, for fifteen minutes, and the alcoholic liquor filtered and evaporated. The residue which was made up of fixed oil, and a brownish matter, was digested in ether to remove the oil, and the remainder redissolved in absolute alcohol, which yielded by evaporation a crystalline mass. This placed in contact with solution of emulsine gave evidence of the presence of hydrocyanic acid, and when observed through a microscope, its crystals were an additional proof of its identity with amygdaline.

Several species of the genus Prunus have been known to yield hydrocyanic acid when treated in a particular manner; and under the impression that all plants that yield this acid by distillation with water contain amygdaline, the following researches were entered upon.

A quantity of the bark of the *Prunus Virginiana* was treated with boiling absolute alcohol, until every thing soluble in that menstruum was removed, and the alcoholic liquid filtered and evaporated to dryness. The extract obtained, amounted to nine per cent. of the bark employed, and had a reddish brown color. When the marc, remaining from the the alcoholic treatment, is moistened with water, no evidence is given of hydrocyanic odor, nor is the result more successful when the extract and marc are moistened together. But when the former is mixed with a solution of emulsine, that odor is immediately perceptible, and then, if the mixture be distilled, *oil of wild cherry bark*, (hyduret of benzule) and hydrocyanic acid are obtained; thus proving the existence of a principle in wild cherry bark which acts as amygdaline, and of a decomposing agent, which, like emulsine, is rendered inert by ebullition.

The alcoholic extract when treated with boiling water is nearly all dissolved, the insoluble portion being principally resin.

If to this aqueous solution sub-acetate of lead be added, until it ceases to produce a precipitate, and a current of hydrosulphuric acid be passed through it, until all the lead is precipitated, and the liquid filtered and boiled to expel the excess of gas, we obtain a colorless, inodorous solution, which, when mixed with solution of emulsine, emits a hydrocyanic odor. If to this mixture a protosalt of iron be added, and then ammonia followed by hydrochloric acid, the blue color of Prussian blue is made evident. When the colorless solution above mentioned is saturated with potassa and then heated, ammonia is evolved. One can readily ascertain if the liquid is saturated, by adding to a portion of it some emulsine, when, if it be not, the characteristic odor is developed. When the potassa is

in excess, the solution is turned to a dark brown color, and is incapable of alteration by emulsine.

The last observations place beyond all doubt the existence of amygdaline in *wild cherry bark.*

To prove that amygdaline exists ready formed in the bark, a small quantity of the powdered bark was rubbed up with water, as in making an emulsion of almonds, and then mixed with a large quantity of cold alcohol, and the whole thrown on a filter.—The filtered liquid when evaporated yielded an extract similar to the one before obtained, being affected by emulsine in the same manner.

When the marc is macerated in water, it evolves none of the usual odor of wild cherry bark when under the same circumstances.

The kernels of wild cherries yield an essential oil and hydrocyanic acid by distillation with water, in all respects similar to the bark, hence we may infer without further examination, that they likewise contain amygdaline as the source of the volatile oil and hydrocyanic acid.

A portion of the dried leaves of the *Prunus Virginiana* were treated with boiling absolute alcohol, and the alcoholic solution thus obtained filtered while hot and evaporated to dryness. This residue was treated with boiling water, until every thing soluble in that menstruum was removed, and then filtered; after it had ceased to produce a precipitate with subacetate of lead, a current of hydrosulphuric acid was passed through the liquid, and the filtered liquid boiled to expel the gas. This liquid when mixed with solution of emulsine, emitted the odor of hydrocyanic acid, which fact sufficiently proves the presence of amygdaline in these leaves.

A small quantity of the kernels of the *Prunus Floridana* (this species being rare and difficult to obtain) was subjected to distillation with water until all the volatile products had passed over. The distilled water had a powerful hydrocyanic acid odor, and when tested by the *Prussian blue process*, the presence of that acid was placed beyond doubt.

To be still more certain, however, a portion of the distilled

water was saturated with peroxide of mercury and filtered. The filtered liquid, though neutral, had the peculiar odor of the last named acid, which is attributable to the volatile oil held in solution. When evaporated, it yielded a crystalline matter, which, from its general characters, was undoubtedly bicyanuret of mercury.

The kernels of the *Prunus montana*, when subjected to the above process, gave a similar result.

Another portion of them was treated according to the process for obtaining amygdaline, which resulted in obtaining a crystalline matter, having the character of the last named substance, and which was affected like it when treated with emulsine, &c.

The kernels of the common cherry, (*Prunus cerasus*) when distilled with water, yield a distilled water impregnated with volatile oil and hydrocyanic acid, which is ample evidence, after the previous observations, of the existence of amygdaline, though, from attendant circumstances, its quantity is very limited.

When the kernels of the greengage were treated as the common cherry just mentioned, a similar result was obtained, from which we may draw a similar inference.

A quantity of the kernels of the damson (*Prunus damascena*) when treated according to the process for obtaining amygdaline, afforded a white crystalline substance, which, when treated with emulsine, emitted a hydrocyanic odor; the mixture was then distilled, and the product saturated with peroxide of mercury; on evaporating this, after filtration, bicyanuret of mercury was obtained. The quantity of amygdaline contained in the damson, quite equals that in the peach.

Thus we see from examination, that all the species of the genera treated of, contain amygdaline, and we are justified in the belief that the presence of this substance is one of the characteristics of these genera.

The time no doubt is approaching when the chemical constitution of plants will be a very important item of their classification, and will establish such classification on a solid and

substantial basis. From the foregoing observations we can arrive at the following conclusions:

1st. That the three genera, *Amygdalus*, *Prunus*, and *Armeniaca*, are closely allied in chemical character.

2nd. That those plants which yield hydrocyanic acid and volatile oil by distillation with water, contain amygdaline as the source of these products.

3rd. That there exists a decomposing agent acting as emulsine, in the leaves and bark of several species of Prunus, which also contain amygdaline.

ART. XXXI.—ON THE CHRYSANTHEMUM PARTHENIUM.

By William Edwin Knight.

(*Extracted from an Inaugural Thesis.*)

For the purpose of analysis I took three portions of the plant, consisting of stem, leaves, and flowers, as furnished by the New Lebanon Society; I macerated them separately,—one in ether, one in alcohol, and the other in water,—each for four days; at the end of this time I decanted.

The ethereal tincture yielded, on evaporation, a copious residuum of a rich deep green color, unctuous to the touch, and having all the peculiar flavor and aroma of the plant in a concentrated degree.

The alcoholic tincture was divided into three portions; one was treated with water, and light green flocculi were precipitated; another with tinct. ferri muriatis, and a dark blue or purple color was produced; the third portion was evaporated, and yielded an extract having a bitter, acrid, astringent, and peculiarly persistent taste.

The cold aqueous infusion was divided into five portions.

First, was heated to ebullition without change.

Second, threw down a copious light colored precipitate, on the addition of alcohol.

Third, treated with pure gelatine, displayed a dense, cloudy precipitate.

Fourth, with a persalt of iron, an abundant dark bluish precipitate.

Fifth, with a protosulphate of iron, changed to a deep blackish color.

I placed a portion of the plant in a small still, adding enough water to cover it, and heating until there had distilled over more than a pint; on removing the receiver, the surface of the contained liquid presented a slight pellicular appearance of essential oil, which had the aromatic taste and smell of the plant, without its bitterness.

The decoction thus prepared, was divided into many portions, to one of which was added iodine, which produced no change. To another, ammonia, without any change, except a slight deepening of the color. To a third, a persalt of iron. To a fourth, protosulphate of iron. The effects produced by these agents differed only by being more intense, from those observed in the cold infusion. To a fifth, was added subacetate of lead, which threw down a very copious precipitate; it was then filtered, and through the clear liquid sulphuretted hydrogen was passed to super-saturation; after which, it was boiled to dissipate the superfluous gas, filtered and evaporated. The result was a brown matter, having a moderately bitter astringent taste, very slightly the peculiar one of the matricaria; this was dissolved in alcohol, and evaporated with very little or no difference in the product. A sixth, was concentrated by slow evaporation, without ebullition, until it had the consistence of a thin syrup; when in this state, and whilst hot, boiling alcohol was poured in, and produced, as was expected, a dense and consistent coagulum; the alcohol was filtered, and evaporated, and yielded an extract of intense, but pleasant bitterness, followed by an after taste of marked astringency. The coagulum consisted almost exclusively of gum and tannin. A seventh was evaporated, and produced an extract similar to the preceding in flavor, but weaker. Several portions of the decoction, and also of the extract, were agitated

with ether, which, on evaporation, yielded a small amount of fatty matter. Another portion was treated in the usual way for obtaining quiniæ sulphas, but without any product.

Destructive analysis was not attempted.

From these experiments it may be concluded, that the *Chrysanthemum parthenium* contains chlorophylle, wax, resin, essential oil, fatty matter, bitter extractive, gum, gallic acid, and tannin; that it does not contain fecula, albumen, or any peculiar alkaloid, or crystallizable principle; and that its activity principally resides in its volatile oil and extractive matter, the effect of both being probably increased by the presence of tannin and gallic acid. From the quantity of tannin this vegetable contains, it is probable that the crystals spoken of by HOOPER, as existing in the old extract, were gallic acid.

In conclusion, it may not be improper to say, that its chemical constituents harmonize admirably with its therapeutic character, showing it equally capable, by judicious management, of acting as a diffusible stimulant, or producing in an eminent degree the more permanent and solid impression of the tonics.

ART. XXXII.—OBSERVATIONS OF LIEBIG, DUMAS AND PELIGOT, KANE, &c., ON PYROACETIC SPIRIT, AND THE COMPOUNDS DERIVED THEREFROM.

WHEN acetic acid is decomposed, through the agency of a high temperature, there is produced a light liquid, bearing strong resemblance to alcohol in many of its properties. This liquid has attracted the attention of many of the best chemists of Europe, the results of whose investigations we will attempt to embody in the present article. It is, however, to ROBERT KANE, M. D., of Dublin, that we are indebted for the greatest amount of information on this subject. Previous to his inves-

tigations, but little more was known of this spirit than its ultimate composition. This alcoholic spirit is derived from the distillation of the fixed acetates and from the decomposition of the vapor of acetic acid, and is described under the names of acetone, pyroacetic spirit, pyroacetic ether, and mesitic alcohol.

To obtain this liquid in a perfectly pure state, it is recommended by LIEBIG to proceed as follows:—Acetate of lead is to be exposed to a high temperature in a retort, and the products collected in a receiver. During this process, the salt first undergoes the aqueous fusion at the temperature of 136° F., boils at 212° F., loses water and becomes solid. On elevating the temperature to 536° F., it again melts, and loses some acetic acid and pyroacetic spirit; the recipient is now to be changed; and, on continuing the heat, pyroacetic spirit and carbonic acid come over. The liquid in the receiver is to be mixed with an equal volume of water, and distilled on a salt water bath; this distillation is to be repeated as long as there is any appearance of oil on the distilled liquid. To deprive the spirit of water, it must be digested for some days upon chloride of calcium in a close vessel, then decanted and distilled from some fresh chloride. Pyroacetic spirit, thus procured, is a light colorless liquid, of a peculiar odor, unlike either alcohol or ether; and miscible in all proportions with water, alcohol, and ether; is permanent in the air, not altered by the alkalies in the cold, and dissolves the resins. Its specific gravity is about .80, its boiling point is 132° F., and the density of its vapor 2.022. This spirit has been analyzed by LIEBIG, DUMAS, and KANE, and their results give its composition as three equivalents of carbon, three of hydrogen and one of oxygen. The formula expressive of its composition, resulting from these experiments, is C^3H^3O, but Mr. KANE is led to conclude, from his experiments,* that the atom of pyroacetic spirit is double of the above, and should be represented by the formula $C^6H^6O^2$. The formation of

* Trans. Royal Irish Acad., 16th March and 10th April, 1837.

this spirit, as the result of the decomposition of acetic acid, is very easy of explanation. If the vapor of acetic acid be passed over charcoal in a tube heated to redness, the only products are pyroacetic spirit and carbonic acid. Now the composition of two equivalents of acetic acid, is expressed by the following formula, $C^8H^6O^6$, from which, if we take C^2O^4, or two equivalents of carbonic acid, there will remain $C^6H^6O^2$, or one equivalent of pyroacetic spirit.

By the action of sulphuric acid upon pyroacetic spirit, successive portions of oxygen and hydrogen, in the proportion to form water, are abstracted, and two new compounds produced. To these Mr. KANE has given the names of mesitylene and mesitic ether, and to complete the regularity of the series adopts mesitic alcohol as the name for the pyroacetic spirit.

Of Mesitylene.

When mesitic alcohol is mixed with sulphuric acid, heat is evolved, the mixture assumes a brown color, and sulphurous acid is produced, when the sulphuric acid is in great excess. The products vary with the proportion of the ingredients; among them, however, are to be found mesitylene, mesitic ether, and a waxy solid. To prepare mesitylene, it is consequently necessary to be careful as to the proportions. The following proportions are recommended by Mr. KANE:—Take two volumes of pure mesitic alcohol, and one volume of sulphuric acid, these are to be mixed and carefully distilled by a well regulated heat. There comes over a watery liquor, strongly impregnated with sulphuric acid, and a yellowish oil, which swims upon the surface of the liquid. This oil amounts to about one-fourth of the mesitic alcohol used. It is to be separated from the liquid by decantation, washed with water, and distilled by means of a water bath. When, by these means, the mesitic alcohol is separated, the temperature is to be increased, so that the mesitylene may come over. Care, however, is to be taken, not to proceed too far with the distillation, or the product may be rendered impure. It is now

to be digested upon chloride of calcium for twenty-four hours, and again distilled to free it from any adhering water. Mesitylene, thus obtained, is a light, colorless, oily liquid, with an odor of garlic; it burns with a white flame, giving off much smoke; it boils at 276° F.; it is not affected by the alkalies. Its composition, as ascertained by Mr. KANE from the mean of three experiments, is six equivalents of carbon and four equivalents of hydrogen, and is represented by the formula C^6H^4, and is, consequently, formed by the abstraction of the elements of water from the pyroacetic spirit.

Of Mesitic Ether.

This is formed by mixing equal volumes of mesitic alcohol and sulphuric acid, the vessel in which the mixture is made being surrounded by cold water. When the mixture is cold, twice its volume of water is to be added, when, on being allowed to rest for a time, a thick fluid rises to the top, and is to be separated by the pipette, and purified by distillation. The quantity thus obtained is small. It may, however, be procured more easily and abundantly from the chloride of mesityl, a liquid to be hereafter described. Chloride of mesityl is to be dissolved in alcohol, and an alcoholic solution of potassa added in excess, the liquid being kept warm; afterwards, six or eight times its volume of water is to be added. On standing, a thick oily fluid will rise to the surface; this is to be decanted, purified from water by chloride of calcium, and distilled. The liquid first obtained contains mesitic alcohol, and is to be taken away and the temperature increased, on which mesitic ether comes over. This is a limpid, colorless, and very fluid liquid, of an aromatic odor, like peppermint; it burns with a luminous, smoky flame, and boils at 248° F. It enters into combination with acids to form salts. It is composed of six equivalents of carbon, five of hydrogen, and one of oxygen, and its formula is C^6H^5O.

The elements of mesitic ether and alcohol may be considered as combining to form the proximate constituents of these bodies in two different modes. In the one case, the carbon

and part of the hydrogen may unite to form the compound radical, mesitylene, while the remaining hydrogen and oxygen unite to form water; the mesitic ether and alcohol will then be considered as respectively the hydrate and bi-hydrate of mesitylene. On the other hand, the carbon and hydrogen of the mesitic ether may unite to form a hypothetical radical, consisting of C^6H^5, when mesitic ether would be an oxide of this radical, and mesitic alcohol a hydrated oxide. Mr. KANE considers this latter theory as most correct, and denominates this hypothetical radical mesityl.

The following list contains the substances described by Mr. KANE, together with the formula of their composition :

Mesitylene, C^6H^4.

Mesitic ether, C^6H^5O, or hydrate of mesitylene, C^6H^4+HO, or oxide of mesityl, C^6H^5+O.

Mesitic alcohol, $C^6H^6O^2$, or bi-hydrate of mesitylene, C^6H^4+2HO, or hydrated oxide of mesityl C^6H^5+O+HO.

Hydrochlorate of mesitylene, C^6H^4+ClH, chloride of mesityl, C^6H^5+Cl.

Hydriodate of mesitylene, C^6H^4+IH, iodide of mesityl, C^6H^5+I.

Sulphate of mesitic ether, $C^6H^5O+SO^3$, or sulpho-mesitylic acid.

Bi-sulphate of mesitic ether, $C^6H^5O+2SO^3$, or persulpho-mesitilic acid.

Phosphate of mesitic ether, $C^6H^5O+P^2O^5$, phospho-mesitylic acid.

Ptelyl, C^6H^3, a hypothetical radical.

Chloride of ptelyl, C^6H^3Cl.

Iodide of ptelyl, C^6H^3I.

Hyponitric oxide of ptelyl, $C^6H^3O^4N$, or $C^6H^3O+NO^3$.

Mesitic aldehyd, $C^6H^4O^2$.

Mesitic chloral, $C^6H^4O^2Cl^2$.

Chloride of Mesityl—Hydrochlorate of Mesitylene.

This compound it is difficult to obtain in a pure state; when liquid hydrochloric acid is mixed with mesitic alcohol, it does

not unite with or decompose it. But when hydrochloric acid gas is passed through this spirit, the gas is absorbed, heat is evolved, and the liquid becomes brown. Totally to change two ounces, it is necessary to continue to act upon the spirit for two days. The resulting dark, heavy liquid is to be washed with water, and then digested upon litharge, and afterwards upon fused chloride of calcium. This liquid is impure chloride of mesityl, and is dark colored and soon decomposes, becoming acid from the liberation of hydrochloric acid. Pure chloride of mesityl may be obtained by acting upon one volume of mesitic alcohol by two volumes of chloride of phosphorus, and adding, drop by drop, three or four volumes of water; effervescence ensues, which is to be moderated by the application of cold. A heavy, slightly colored fluid is obtained, which is to be washed with the smallest quantity of water possible, and then poured upon recently fused chloride of calcium, which separates the water and is not itself soluble in the chloride. Any attempt to purify this liquid by distillation, decomposes it with the liberation of hydrochloric acid. The formula, C^6H^5Cl, expresses the composition of this substance.

Iodide of Mesityl—Hydriodate of Mesitylene.

This is prepared by acting upon mesitic alcohol by iodine, phosphorus, and water, aided by heat. It is volatile, and distils over; its probable composition, is C^4H^5I.

When mesitic alcohol is acted upon by the oxygen acids, it becomes hot, and of a dark brown color. The acids combine with the mesitylene and form new acid compounds, capable, when neutralized, of forming salts with bases. With sulphuric acid, two acids are formed, varying in composition according as this acid is used in a greater or lesser proportion. To these acids the names sulpho-mesitylic, and persulpho-mesitylic acids are given. With lime, baryta, and lead, these acids form soluble salts.

Persulpho-mesitylate of lime forms, upon evaporation, a deliquescent granular mass. which cannot be dried completely,

but when heated strongly, takes fire, and leaves a white alkaline residue. Its composition is expressed by the formula $(2SO^3+C^6H^6O^2)+CaO$.

Sulpho-mesitylate of lime is similar to the former; the formula of its composition is $(SO^3+C^6H^5O)+CaO$.

Persulpho-mesitylate of baryta crystallizes in small pearly plates; when heated, becomes brown, chars, and sulphate of baryta is left; its formula is $(2SO^3+C^6H^5O)+BaO+HO$.

Sulpho-mesitylate of baryta could not be isolated, and the sulpho-mesitylates of lead were not examined.

With the acids of phosphorus, two new acids were obtained, viz., the hypophospho-mesitylic, and the phospho-mesitylic acid. The hypophospho-mesitylic acid is formed by acting on mesitic alcohol by phosphorus and iodine, in the mode directed for the formation of iodide of mesityl. After the distillation of the iodide, there remains in the retort white amianthine crystals. These are soluble in water, affording a colorless liquid of a strongly acid and intensely bitter taste; neutralized by baryta, it yields an insoluble phosphate of baryta, and a soluble white salt. This solution, evaporated to dryness, concretes when cool; when the mass is to be boiled in strong alcohol, to dissolve out iodide of barium, until no trace of iodine remains. It is thus rendered pure, and remains as a white crystalline mass, neutral to test paper, and when heated, takes fire, giving off copious fumes of phosphoric acid.

Its composition is represented by the following formula, $2P^2O.BaO+C^6H^5O+HO$, containing one equivalent of water, from which it cannot be separated without decomposition.

Phospho-mesitylic acid is generated by the action of pure glacial phosphoric acid, upon mesitic alcohol. During this action heat is evolved, and the mixture becomes brown. On neutralizing the solution with soda, a liquid was obtained, which yielded, on evaporation, phospho-mesitylate of soda. This salt crystallizes in rhomboidal plates, which, on exposure, becomes opaque. On being heated, it melts in its water of crystallization, and, by the loss of this water, becomes a

white mass, which, on exposure to a higher temperature, swells, blackens, and finally, burns; leaving a residue of phosphate of soda. Its formula is $P^2O^5+C^6H^5O+NaO+5HO$.

Of Ptelyl.

Ptelyl is a name given by Mr. KANE to a hypothetical radical, which he supposed might be the radical of ulmic acid. The formula which he gives for it, is C^6H^3, and states that mesitylene may be considered as a hyduret of ptelyl, and expressed by the formula C^6H^3+H. The supposition that a radical of this composition exists, is only useful for the purpose of explaining the nature of some of the following compounds, but it would seem, upon the accurate examination of the results of the analysis given, that its adoption at present is rather premature, as the analytic results do not coincide with sufficient accuracy with the formula given.

In accordance with the above hypothesis, the name of chloride of ptelyl is given to a substance obtained by the action of chlorine gas upon mesitylene. In this process the chlorine is absorbed abundantly, heat is evolved, and effervescence takes place from the free liberation of hydrochloric acid gas; small needle-shaped crystals form at the edge of the liquid, and finally the whole solidifies. Ether, having been boiled upon this crystalline mass, deposits on cooling, brilliant, white, four-sided prisms, which may be completely purified by successive solutions and crystallizations. The crystals thus obtained are not soluble in water, and are not acted upon by a solution of potassa. They are volatile at a high temperature, without decomposition, and, in fact, appear to be the most stable of the compounds formed with a radical of mesitic alcohol. The analysis of two portions of the crystals gave the following results:

1.—0.352 of crystals gave	carbonic acid,	0.645
	water,	0.145
2.—0.549	carbonic acid,	0.976
	water,	0.215

	I.	II.		I.	II.
Equivalent to carbon,	.176	.266	or in 100 parts	50.	48 45
hydrogen,	.016	.024		4.6	4.37
The remainder being chlorine,				45.4	47.18
				100.	100.

The formula deduced from which is C^6H^3Cl, the chlorine, apparently, replacing an atom of the hydrogen of the mesitylene, the other elements remaining the same.

Iodide of ptelyl is the substance left in the form of yellow scales in the retort, after the distillation of iodide of mesityl. Its properties are analogous to those of the chloride. Sufficient was not obtained for analysis, but from analogy its composition is supposed to be C^6H^3I, the iodine replacing an atom of hydrogen.

By the action of nitric acid upon mesitic alcohol, two fluids are obtained, to which the names of hyponitrite of ptelyl and mesitic aldehyd are given. The action of the two substances on each other is very violent, and copious red fumes are produced. If the mixture be heated, the action is explosive; but the process may be conducted with safety by alternately slightly warming and then cooling the mixture, and finally, when the action has ceased, on the addition of five or six volumes of water, a pale yellow fluid subsides, which may be freed from acid by washing, and subsequently dried by chloride of calcium. The liquid thus obtained may be separated in two parts, one thin and fluid, the other semi-fluid, but both heavier than water. The thin fluid is of dark brown color, its odor and taste penetrating and sweetish; it is explosive by heat, and soon decomposes when in contact with water. To this liquid the name of hyponitrite of ptelyl is given, but it could not be obtained sufficiently free from the thicker liquid to afford on analysis satisfactory results. The formula $C^6H^3O^4N$, or $C^6H^3O+NO^3$, is given as its probable composition.

The thick heavy liquid is denominated mesitic aldehyd, or hydrate of ptelyl. This may be obtained pure, by boiling nitric acid with mesitylene. It is a reddish yellow, thick,

heavy fluid, of a sweet and penetrating odor, it must be well washed with water, and dried by chloride of calcium. Its composition is $C^6H^4O^2$. Exposed to dry ammonia it absorbs the gas rapidly, forming a resinous mass, from which crystals of mesitic aldehyd of ammonia may be obtained by solution and cautious evaporation. A solution of these crystals produces a yellow precipitate with nitrate of silver.

Mesitic chloral is a compound produced by the action of chlorine gas upon mesitic alcohol. It is formed by passing this gas through mesitic alcohol. Hydrochloric acid is formed, together with a heavy liquid. After the action has ceased, the hydrochloric acid is to be driven off by a moderate heat, carefully applied, and not raised so high as to decompose the chloral, it is then to be dried by chloride of calcium. Mesitic chloral is a heavy oily liquid, boils at 260° F.; dropped upon the hand it produced redness and vesication, more difficult to heal than that from cantharides. Its composition is expressed by the formula, $C^6H^4O^2Cl^2$, or the elements of mesitic aldehyd combined with two equivalents of chlorine. This substance had been previously noticed, but not analysed by Matteucci, and subsequently it was formed and analysed by Liebig, whose results approximate closely to those of Mr. Kane. When mesitic chloral is put in contact with a base, it entirely disappears, and mesitylene, chlorine, and a new acid, are produced. The nature of this acid it is intended to investigate still farther. The name of pteleic acid is, however, given to it, and its probable composition is stated as $C^6H^4O^4 = C^6H^3O^3 + HO$.

R. B.

SELECTED ARTICLES.

ART. XXXIII.—OBSERVATIONS UPON THE FORM, OR APPARENT STATE, WHICH THE COMBINATIONS OF CERTAIN BODIES WITH CAMPHOR ASSUME, AND UPON THE PROPERTIES WHICH THESE BODIES POSSESS OF MASKING, DIMINISHING, OR EXALTING ITS ODOR. By M. PLANCHE.

THE simple and well known method of our associate M. Garot, for coating pills in such a way as to mask their odor, has induced me to recur to experiments made some time before, with another end in view; as a secondary result of one of them, was the disappearance of the odor of camphor in a mixture where this body was associated with another, having an agreeable and sweet smell.

It is already evident, and the title of this notice sufficiently indicates it, that what I have to say has nothing in common with the method of my colleague.

The question in magistral pharmacy which, in the first place, I proposed to myself, was this: The more or less considerable softening which accompanies the reaction between camphor and assafœtida, (a phenomenon familiar to all practitioners of pharmacy,) is it common to all gum-resins, resins, and other analogous substances? From the first experiment the question became complicated with a collateral circumstance, which appeared to me so interesting as to induce me to separate it, and thus render its developement more easy. I mixed equal weights of camphor and assafœtida, both in powder, and I perceived that besides an instantaneous softening of the mass, the odor of the camphor was considerably

diminished, and after twenty-four hours it was hardly perceptible, that of the assafœtida alone remaining. The experiment was repeated with other substances in the same state of aggregation. At first with the following gum-resins: galbanum, sagapenum, olibanum, opopanax, tacamahaca, euphorbium, bdellium, gamboge, myrrh, scammony, ammoniac; then with ánime, sandarach, mastic, dragon's-blood, the resin of guaiac, of scammony, of jalap, with rosin, colophany, balsam of Tolu and benzoin, with amber, and finally with the resinoid matter of cinchona.*

Experiments so simple do not admit of any details of manipulation, but the question embraces two orders of phenomena, which it is indispensable to point out, to wit, the state of aggregation or division of each mixture, either immediately after the experiments, or after a certain lapse of time; and the intensity of the odor of the camphor, of which the degree, from not being capable of being determined by the smell, is, in fact, somewhat arbitrary. It would be tedious, from the number of substances passed in review, to give for each a detailed description of the phenomena observed, and it would too much lengthen this article.

I have, then, adopted the plan of establishing two categories corresponding to the two orders of phenomena indicated, and of dividing them into several groups, without regard to the nature of the substance added.

The first category comprehends five groups, each one of which contains the mixtures that present an apparent resemblance, at least, as regards consistence, division, hygrometric power, &c. The second category, formed of the same mixtures as the first, comprises three groups. To the first, appertain the mixtures in which the odor of camphor is entirely absorbed; to the second, those which feebly retain the odor of this substance; and, finally, in the third group, those that exalt the odor of camphor, or powerfully retain it.

* All these substances, with the exception of ánime and sagapenum, were employed in powder. The camphor, reduced by means of alcohol, was exposed to the atmosphere for a day before making the mixtures.

FIRST CATEGORY.

First Group.

Mixtures which take the pilular consistence, and which preserve it indefinitely:

Dragon's-blood,	Assafœtida,
Guaiacum,	Galbanum.

Second Group.

Mixtures which, in the first place, having a pilular consistence, ultimately become soft from exposure to the air:

Benzoin,	Gum ammoniac,
Balsam of Tolu,	Mastic.

Third Group.

Mixtures of a semi-liquid consistence:

Sagapenum,	Anime.

Fourth Group.

Mixtures which present a pulverulent form, somewhat granulated, and which retain it:

Olibanum,	Bdellium,
Opopanax,	Myrrh,
Gamboge,	Amber,
Euphorbium.	

Fifth Group.

Mixtures which indefinitely retain the pulverulent form:

Tacamahaca,	Sandarach,
Resin of jalap,	Resinoid matter of cinchona.

SECOND CATEGORY.

First Group.

Mixtures in which the odor of camphor is absorbed, the substance added retaining its own peculiar odor:

Assafœtida,	Anime,
Galbanum,	Balsam of Tolu,
Sagapenum.	

Second Group.

Mixtures feebly retaining the odor of camphor:

Dragon's-blood,	Opopanax,
Olibanum,	Tacamahaca,
Mastic,	Guaiac,
Benzoin,	Ammoniac.

Third Group.

Mixtures which exalt the odor of camphor or retain it strongly:

Gamboge,	Scammony,
Euphorbium,	Sandarach,
Bdellium,	Resin of scammony,
Amber,	Rosin,
Myrrh,	Colophany,
Resin of jalap,	Resinoid matter of cinchona.

If I am not deceived, this ungrateful task, incomplete as it is, should furnish some profitable lessons to the young practitioner, as well as to the pharmaceutist. The following fact, taken at hazard from many which have presented themselves to me, will prove, I hope, what I have stated.

A young physician of Paris, an élève of a celebrated professor of Materia Medica, and who, it may be stated *en passant*, had published a book upon this part of medicine, prescribed a *fumigatory powder*, composed of incense, balsam of Tolu, benzoin, amber, and camphor. The formula was exactly executed, each substance being partially pulverized, but, instead of an homogeneous powder, the mixture presented a grumous mass, a sort of magma; and the young Doctor came to complain, in terms little measured, on account of the formless preparation that had been furnished him. I endeavored to convince him that this result was inevitable,

and that it was necessary in order to preserve the mixture in a pulverulent state, without changing the proportions of the ingredients and without altering its properties, to add to it an inert substance, which I indicated to him. He did not wish to deduct any thing; the preparation was decidedly made badly. The discussion became more and more animated, and threatened to terminate disagreeably.

In this state of things, I employed a last argument, which made him lower his tone. I presented to the Doctor all the substances in a pulverized state, which were mentioned in the formula, requesting him to please mix them himself. He did so, and acknowledged his error; and I must say, as a man of honor, he became reconciled without retaining any ill-will.

It would be useless to enter into long details as to other applications of this essay; in practice they will present themselves to the mind of the reader.

Those which at first sight are most apparent, are connected with the preparation of powders, pills, and plasters, of which camphor, the gum-resins, resins, &c., form the constituent part. If the properties of sandarach and those of mastic are compared, as regards camphor, the possibility may be determined of detecting the mixture of the two resins, a frequent sophistication in commerce, in consequence of their great difference in value.

It, moreover, would be found, if we were not in possession of several means, that this was a convenient one for distinguishing the resins of jalap and scammony.

As regards the modifications which the odor of camphor undergoes under the same circumstances, without having a practical application in view, they ought not to be indifferent to the pharmaceutist who regards his profession as something more than a manual art. I will say further, that observations of this kind or those analogous to them, however unpretending they may be, will sooner or later terminate by finding their place in science, should it only be as the point of departure to researches of a higher order.

Journ. de Pharmacie.

ART. XXXIV.—COMPARATIVE EXAMINATION OF ANTIMONIURETTED AND ARSENIURETTED HYDROGEN, AND UPON THE NEW MODES OF REDUCING THE SULPHURET OF ARSENIC. By J. F. Simon.*

The interesting discovery of antimoniuretted hydrogen, made at the same time by MM. Thompson and Pratt, renders very uncertain the method of Marsh for the discovery of arsenic.

I prepared these two gases by adding to a mixture of very pure zinc and diluted sulphuric acid, a solution of arsenious acid and of tartar emetic. The following are the characters which I recognised:

1. Antimoniuretted hydrogen, heated in a glass tube, is decomposed like arseniuretted hydrogen, and gives a metallic coating, but which is more silver white than that of arsenic. In very thin films, the antimony appears of a deep gray, and the arsenic of a deep brown. The flame of the two gases in combustion is identical.

2. Neither gas is absorbed by water.

3. Solutions of potassa, ammonia, and nitric acid, have no action upon them.

4. A solution of chlorine decomposes antimoniuretted hydrogen, and, at the commencement, retains nearly all the antimony in solution, but at the end of some time deposits it in white flocculi, and the solution becomes very acid. A similar reaction takes place with arseniuretted hydrogen, with this difference, that with this latter gas no precipitate is formed, the arsenic remaining in solution in the state of arsenious acid.

5. A solution of iodine in alcohol decomposes both gases, and, at the end of a certain time, becomes totally discolored. With the antimoniuretted hydrogen, it forms brown flocculi, and none of the antimony remains in the solution. With

* Ann. de Pog., t. 42, p. 563.

arseniuretted hydrogen, on the contrary, but an insignificant black precipitate falls down, and the greater part of the arsenic may be found in the solution.

6. A solution of bromine likewise completely decomposes the antimoniuretted hydrogen; the solution becomes troubled without being discolored and deposits white flocculi, retaining no antimony in solution. With arseniuretted hydrogen it does not form a precipitate, all the arsenic remaining in the solution.

7. A solution of sulphuretted hydrogen has no action upon these gases, even after the addition of a certain quantity of potassa.

8. A solution of corrosive sublimate completely absorbs antimoniuretted hydrogen, becomes troubled, and deposits a precipitate, which is at first white, and afterwards becomes gray. Arseniuretted hydrogen gives a yellow precipitate, which becomes brown, and afterwards black; all the mercury is precipitated, and the solution contains arsenious acid.

9. Both gases decompose a solution of nitrate of silver, giving rise to a precipitate which, with arseniuretted hydrogen, is pure silver, all the arsenic remaining in the solution, whilst with the antimoniuretted hydrogen, all the antimony is thrown down with the silver, none of it remaining in solution.

10. Solutions of acetate of lead, sulphate of zinc, and protochloride of iron have no action upon these gases.

11. The solution of sulphate of copper exercises but a feeble decomposing action upon these gases, forming some black flocculi.

12. The solution of platinum is promptly colored black by these gases. A black precipitate is formed, composed either of antimony and platinum, or of arsenic and platinum.

13. These two gases have no action upon each other.

14. If sulphuret of arsenic is added to a mixture of zinc and diluted sulphuric acid, arseniuretted hydrogen is disengaged; likewise, if kermes be added to the mixture, a certain quantity of antimoniuretted hydrogen is evolved.

15. If we dissolve kermes in a solution of caustic potassa, and add to it a solution of acetate of lead, and, finally, diluted sulphuric acid and zinc, antimoniuretted hydrogen will be disengaged. A similar reaction takes place when arsenic is used.

It results from this comparative examination, that we have no good means of immediately distinguishing these two gases, especially if they exist in very small quantities, and that, consequently, the process of Marsh, for the detection of arsenic, should be rejected.

I have tried the new processes for the detection of arsenic, and I have ascertained that the plan of Berzelius presents great advantages. This process consists, as is well known, in decomposing in a small tube, by means of a fragment of charcoal impregnated with carbonate of soda, the sulphuret, which is caused to pass over it in the form of vapor. This process possesses the great advantage of not giving rise to any uncertainty, as the sulphuret of antimony does not produce a similar reaction. We may likewise decompose the sulphuret of arsenic by a mixture of caustic lime and charcoal.

I added to a mixture of zinc and diluted sulphuric acid, salts of tin, platinum, silver, chromium, mercury, lead, and some other metals, but none of these metals gave combinations with hydrogen.

Ann. des Mines.

ART. XXXV.—OBSERVATIONS UPON A FORCE HITHERTO UNKNOWN, AND UPON THE ACTION WHICH IT EXERCISES IN THE FORMATION OF CHEMICAL COMBINATIONS IN THE LIVING SYSTEM. By M. Berzelius.

Previous to the year 1800, it was hardly doubted that there could exist in these phenomena any other determining cause than the degree of affinity, caloric, and, in some cases, light. At that time the influence of electricity was discovered, which led to the confounding the electrical with the chemical relations of bodies, and to consider affinity only as the manifestation of a strong electrical contrast, increased by light and caloric. This system presents no other mode of explaining the origin of a new compound, than by supposing, that, by the approach of two bodies placed in presence of each other, their electrical states become neutralized in a more or less complete manner.

Setting out upon these ideas, deduced from the effects which take place in inorganic nature, and studying the chemical reactions which organized bodies present, we discover that, in these latter organs, substances the most diverse are eliminated; whilst the crude matter, from which they proceed, consists in general, of only one liquid, circulating with more or less quickness in the vessels. The vessels of the animal body, for example, propel the blood to their point of origin without interruption, and secrete nevertheless, at their extremities, milk, bile, urine, &c., without the admission of any other liquid capable of causing by its affinity any decomposition whatever. Here an evident change takes place, which the study of organic nature cannot as yet explain.

About this time, Kirchoff discovered that amidon, dissolved in a weak acid, is changed at a certain temperature, first, into gum, and then into sugar of grapes. He sought, in conformity with the principles received with regard to effects of this kind, for that which the acid had separated from the amidon to reduce it to sugar; but no gas was disengaged, the acid,

not being in combination, was, by means of alkalies, reproduced in its primitive quantity, and the liquid contained sugar, rather greater in quantity than the amidon employed. The cause of this change was thus quite as problematical as those of the secretions in organized bodies.

After relating many observations of MM. Thenard and Gay Lussac, concerning substances determining chemical reactions without being themselves changed, the author adds:

"The change of amidon into sugar, by means of sulphuric acid, had not yet been classed with the preceding facts. In the mean while, the discovery of diatase, (announced in the year 1833,) a substance acting upon amidon in an analogous manner, only with more energy, drew attention to this analogy, which was definitely proven by the ingenious researches of Mitscherlich upon the formation of ether. The investigations of Mitscherlich proved, likewise, that sulphuric acid, suitably diluted, and at a temperature such that the cold produced by the addition of the alcohol compensated for the elevation of temperature in the mixture, decomposes alcohol into ether and water, and that, when the temperature surpasses that of boiling water, both separate by the distillation of the mass, and present, when the condensation is complete, a mixture of the same weight as that of the alcohol employed. The mode of operating in this experiment, as well as the fact of the distillation of the ether, together with the water, was known before Mitscherlich, but it is to him that the merit is due, of perceiving the consequences. In fact, he demonstrated that, at this temperature, the sulphuric acid acts upon the alcohol in virtue of the same force which determines the action of the alkalies upon oxygenated water, and since the water, in separating itself entirely from the mixture, did not obey an affinity for the acid, he concluded that the action of sulphuric acid and of diatase upon amidon, from which sugar results, should likewise be of the same nature.

Truly, such a force, capable of effecting chemical reactions in inorganic nature as well as in organized bodies, although as yet too little known to be well explained, should play a

more important part in nature than we as yet have been tempted to suppose. I, therefore, will name it, following an etymology well known in chemistry, the *catalytic force* of bodies; and the decompositions which it determines, *catalysis*, in the same way as we designate by analysis the separation of the elements of a compound by means of the ordinary affinities of chemistry. This force appears to consist definitely in a faculty of bodies to set in action, by their simple presence, the play of certain affinities, which at that temperature remain inactive, so as to determine, in consequence of a new re-division of the elements of the compounds, a new state of perfect chemical neutralization. As this force acts, in general, in a manner analogous to heat, we may ask whether, when differently graduated, either by a different use of the catalytic body, or by the introduction of different catalytic bodies in the same liquid, it would give rise, as has been observed in the action of heat and different temperatures, to different catalytic products? The existence of this definite force, spreads a light altogether new upon the chemical reactions of organic bodies. We will cite but one example. Around the eye of the potato diatase is found accumulated, which, on the contrary, is entirely wanting in the developed germ; and in the tubercle we recognise in this point a centre of catalytic action, from which the insoluble amidon of the tubercle is changed into gum and into sugar, and this part of the potato becomes the secretary organ for the soluble substances, which form the juices—the nourishment of the growing germ. It is hardly probable that the action mentioned should be the only one of the kind in vegetable life; we may on the contrary presume, that, in vegetable, as well as in the animal bodies, a thousand catalytic effects take place between the tissues and the liquids; from whence exactly result the great number of different chemical compounds, the production of which at the expense of the same crude matter, which we call blood and vegetable juice, cannot be explained by any other known cause.

Journ. de Chim. Med.

ART. XXXVI.—REPORT MADE TO THE ROYAL ACADEMY OF MEDICINE BY M. PLANCHE, IN THE NAME OF A COMMITTEE, UPON A NEW JALAP PROPOSED BY M. LE DANOIS AS A SUBSTITUTE FOR OFFICINAL JALAP.

When any substance whatever appears in the drug market with a determined therapeutic destination, when it is calculated, moreover, to take the place of a well known medicine, the use of which has been established by long experience, it is important to determine how far the new substance resembles, and in what it differs from, either in its composition or medicinal properties, that with which it is placed in competition. This mode of proceeding, the most rational, the only one that can advance the Materia Medica, is that which the Committee has thought should be followed with respect to the new jalap brought from Mexico by M. Le Danois, and upon which the Minister of Public Instruction, in his letter of May 13th, has consulted the Academy.

The new jalap,—presented by M. LeDanois, and which this naturalist has designated under the name of *Convolvulus Orizabensis*, from the name of the city of Orizaba, in the neighborhood of which the plant grows in abundance,—has already been mentioned in detail in the *Histoire Abrégée des Drouges Simples* of M. Guibourt, as well as in the *Dictionnaire de Materie Medicale* of MM. Merat and De Lens. Its botanical characters, compared with those of the *Convolvulus officinalis*, but with which we shall not at present meddle, have also been described in a notice by M. Gabriel Pelletan, published in 1834.*

* The variety of jalap, introduced into the Philadelphia market, which has been described by Mr. Daniel B. Smith in his paper upon jalap, published in this Journal, p. 34, vol. ii., is undoubtedly the article here referred to. Of this Mr. Smith was aware; as he traced the resemblance between it and the article under the name of male jalap, sent to France from Mexico by M. Le Danois. At the time the paper was written, no very specific description of the plant yielding it had reached this

Before experimenting with the new jalap, and ascertaining, as a point of departure, the chemical investigations which have already been made, the committee has thought it requisite also to take into consideration as an object of comparison, the most recent and probably the most complete analysis that has been made of officinal jalap.

It results from this preliminary investigation:—

1st. That the *Convolvulus Orizabensis*, analyzed by M. Le Danois, has given in one thousand parts,—

Resin,	80
Gummy extract,	256
Fecula,	32
Albumen,	24
Lignin,	580

2d. That the *Convolvulus officinalis*, analyzed by M. Felix Cadet, has afforded in one thousand parts,—

country. We are now enabled to supply the deficiency from the third edition of the *Histoire Abrégée des Drouges Simples*, by M. Guibourt. He states that it is known in the shops of Paris by the name of *light jalap*, (jalap léger,) but that he prefers that of *fusiform jalap*.

"This species of jalap, (*Convolvulus Orizabensis*, Pell., *Journ. de Chim. Med.*, t. x., p. 10,) has a large root, which is cylindrical, fusiform, twenty inches long, branched at its termination. It is yellow exteriorly, of a dull white internally, and lactescent.

The plant is slightly villous throughout. The stem is cylindrical, green, pretty firm, little voluble, and can dispense with support; the leaves are very large, rounded, deeply cordiform, shortly acuminate, villous on the inferior nerves; the petioles are also villous, of the same length as the limb. The peduncles are slender, uni, rarely bi-flowered. The corolla is campanulate, of a reddish purple, stronger and thicker than that of the true jalap; the limb little patulous. The stamens and pistil are short and included. The capsule is two-celled, one-seeded. The seeds are almost spherical, of a blackish brown, and a little rugose." His description of the drug is precisely that given by Mr. Smith, to which the reader is referred. With the paper now presented, the *Journal of Pharmacy* contains all the information respecting jalap that has been obtained up to the present time.

J. C.

Resin,	100
Gummy extract,	440
Fecula,	24
Albumen,	24
Lignin,	290

"It is seen, by this statement, that in the new jalap the amount of the resin, or the active principle, is less by a fifth than in the officinal article, whilst the lignin, or inert matter, is in exactly double the proportion, and that an inverse proportion holds, as regards the gummy extract.

"The committee, furnished with this preliminary knowledge, applied themselves directly to the undertaking. At the same time that they experimented with the new jalap in disease, they verified the results of the analysis of M. Le Danois; yet, without pre-occupying themselves with the relative quantity of the substances which, in this jalap, accompany the purgative principle, they have confined themselves to merely stating their existence, so as to devote their attention more particularly to the latter. Thus they ascertained that the proportion of resin, fixed by M. Le Danois at eight per cent., did not exceed six and a half per cent., in the specimen deposited by him with the Academy, the mean of two operations performed with the greatest care.

"Whether the decidedly ligneous texture of this jalap, a greater dissemination of the resin, a peculiar condition of it, or some other cause presented an obstacle, we have not been able to succeed in isolating the resin by means of aqueous maceration, a method employed with success upon the officinal jalap by one of the committee, so that we were obliged to have recourse to alcohol in the preceding operation.

"We perceive in the memoir of M. Le Danois, a simple and direct statement of his having obtained resin, which would lead us to rely upon it implicitly, but which does not prove that there is an entire similitude between this product and the resin of the old jalap.

The committee wishing to determine this still undecided

question, which especially applies to the art of prescribing, have examined comparatively the two resins. They have determined that if the resin of the *Convolvulus Orizabensis* resembles in some points that of the officinal jalap, it differs from it in others; which analogies and differences can be summed up in a few words under the two following heads:

Properties common to the two Resins—Properties peculiar to each of them.

The properties common to the two resins are—

1. Their solubility in alcohol.
2. Their solubility in cold nitric acid without the extrication of deutoxide of azote.
3. Their color; although, in strictness, this character should be of little value, the decoloration taking place without the resin being in other respects affected.

The properties peculiar to the *resin of the new jalap* are—

1. A sweetish, slightly nauseous taste.
2. Solubility in ether.
3. Suspension in water without an intermediate substance.

Those peculiar to the *resin of the old jalap* are—

1. An acrid, irritating, persistent taste.
2. Insolubility in ether.
3. Agglutination in water, even when cold.

It follows from this comparison that, in the pharmacological classification of the resins of the *convolvulaceæ*, that of the new jalap should form the type of a new genus, intermediate between two others, one of which comprehends the resin of the *Convolvulus officinalis*, the other that of the *Convolvulus scammonia*.

We have, moreover, found in the new jalap both nitrate of potassa, and a substance which becomes green upon exposure to the atmosphere. It is insipid, insoluble in cold water, partially soluble in boiling water, insoluble in absolute alcohol and in ether, either cold or hot. This substance is obtained by precipi-

tating with water the residual liquid of the distillation, by the salt water bath, of the alcoholic tincture prepared by maceration with the powder. At the moment water is added, the mixture is whitened as in the case of officinal jalap; but after five or six hours, the greater part of the resin having precipitated, the supernatant liquid begins to become clear; it is exhibited of a delicate yellow color. In the space of twelve hours, this color passes to an apple green, and ultimately, after several days, to a deep green, there being deposited upon the sides of a capsule a coating of the same color. We have not pushed the examination of this substance further, which certainly is not chlorophylle; the phenomena of coloration resemble, in this respect, but in this only, those of indigo.

As to the nitrate of potassa, we obtained it by treating with cold water, the marc of jalap exhausted by alcohol. The liquor resembling very thick syrup in consistence, was abandoned to spontaneous evaporation in a vessel, the temperature of which was maintained at 15° C. At the end of twenty days, beautiful prismatic crystals, from five to six lines in length, presented themselves upon the surface of the desiccated extract; they had all the characters of nitre.

Two members of the committee undertook the investigation, with respect to the medical properties of the *Convolvulus Orizabensis*, upon a certain number of patients in their respective service at the Hôtel Dieu. Here the task of the reporter is rendered simple; in as much as the observations accorded, without communication between the experimenters, it will be sufficient to communicate the results entire to the Academy to impart all information necessary upon this point.

The root of the new jalap, reduced to powder under the inspection of one of the committee, was administered in thirty-three cases, where purgation was indicated. It was given thirteen times in the dose of a drachm, sixteen times in the dose of half a drachm, and four times in the dose of twenty-five grains, always in a cup of vegetable broth.

Of the patients who took a drachm, four experienced no

appreciable effect, nine had from two to eleven stools; two of the first had colic resembling that from lead. One of them took the next day an ounce and a half of castor oil, which procured five stools, and the succeeding day another drachm of the *Convolvulus Orizabensis,* which likewise produced five stools. The second, on whom the jalap had not manifested any effect upon the first day, took on that following another dose of one drachm, which was followed by a copious stool. Of the sixteen patients who took half a drachm, three had one stool, three had two stools, one had three stools, one from four to five stools, two from five to six stools; in the remaining four there was no effect.

In general, the action of the medicine appeared similar to that of the *Convolvulus officinalis;* like this, it presented irregularities and anomalies. It may be considered as certain, that the *Convolvulus Orizabensis* is endowed with less energetic purgative properties, and consequently it must be employed in the dose of from thirty to thirty-six grains at least, to act as the customary purgatives.

The purgative effect, whenever it took place, once only excepted, was mild and unaccompanied with colic.

Now if the Academy will recollect that the proportional relation between the resin of the new jalap and that of the old is as six and a half to ten, and that this resin is destitute of acridity, it will doubtless agree with us, that the results of the analysis accord with the therapeutic effects.

CONCLUSION.

The committee, from the foregoing, have the honor to propose to the Academy to reply to M. the Minister,

1st. That the root of the *Convolvulus Orizabensis* can be employed as a purgative medicine, by augmenting the dose, under the same circumstances as when the use of officinal jalap is indicated.

2d. That in consequence of the difference between it and the old jalap, both in the proportion of the purgative principle and the chemical properties of this principle, the new medi-

cine should be designated in medical prescriptions by its specific name, so that no doubt may exist, and the substitution of the new species for the old in mercantile transactions may be avoided. *Journal de Pharmacie.*

ART. XXXVII.—NEW METHOD OF COVERING PILLS WITH A COATING OF GELATINE. By M. Garot.

I had prepared, some time ago, in accordance with the prescription of a physician of my neighborhood, a mixture of cubebs and other powders, which I incorporated into the balsam of copaiba; and I employed, in order to render the administration easier, the empty capsules obtained from our associate, M. Dublanc. Having prepared anew the same mixture, and being in want of capsules, I sent to our associate for them, but was informed that, from some new arrangement, the proprietor of the gelatinous capsules was no longer willing to furnish them empty to apothecaries.

To comply with the wishes of the physician, who was desirous that the medicine should be prepared by myself, or thus to speak, under his own eyes, and also to enable apothecaries themselves, to prepare the pills that physicians may direct, I have endeavored to attain the means by which we may be relieved from the embarrassment under which we have labored.

The method that I am about to indicate is easy and expeditious; it may be applied to all medicines that can be made to assume a pillular consistence, whether balsam of copaiba, camphor, musk, assafœtida, sulphuret of potassa, the mercurial preparations, the ferruginous, or others. The odor and taste are completely disguised, and the mass thus enveloped preserves for a long time its softness. No matter what the form or size of the pill, there is the same facility in its application,

so that, hereafter, physicians can direct that pills shall be covered with gelatine, as heretofore with silver.

The least skilful apprentice, after a few trials, can prepare two hundred pills in an hour, and they can be delivered one or two hours afterwards.

MODE OF PREPARATION.

After having made the pills of the size directed, they are placed upon the point of a pin; I employ black pins, which are long and thin. Purified gelatine is then dissolved in a little water, at a moderate heat, so that when cold it shall have the consistence of thick jelly; to an ounce of gelatine, two or three drachms of water are sufficient. When thus prepared, it is kept in the proper state by a salt water bath, otherwise there would form on the surface a pellicle which would impede the operation. Things being thus arranged, the pills are dipped into the solution, so as to cover them entirely, and, while withdrawing, a rotary motion is communicated; the pins are then stuck into any tenacious mass, or a pincushion, so as to keep the pill erect in the air, in the same way as in making oxygenated matches. When about fifty pills are prepared in this way, the hole formed by the introduction of the pin is to be obliterated. In order to accomplish this, the pin is held in the flame of a taper and heated, while the pill is removed; the heat thus communicated is sufficient to liquify the gelatine around the point of connexion, and solders up the vacuity. In this way a pill is obtained perfectly round and shining, with no vestige of the hole, and having the peculiar color of the mass. Care must be taken not to allow the gelatine to become too dry, for then, instead of melting, it becomes corneous by heat.

For such pills as I have presented to the Society, as those of musk, assafœtida, and camphor, a single layer of gelatine is sufficient to mask their odor; but for certain substances having a penetrating smell, as balsam of copaiba, animal oil, the volatile oils, &c., it is necessary to dip them a second time in the gelatine.

A remarkable circumstance, and one which is easily explained, is, that the gelatine, into which the different pills were plunged, which I presented to the Society, does not retain the odor of any of them; the same gelatine may, therefore, be used for all kinds of pills.

Journ. de Pharmacie.

ART. XXXVIII.—ON THE BOILING OF MIXTURES OF TWO LIQUIDS, AND THEIR EXPLOSIONS. By M. Magnus.*

Few things in physics have been so completely examined as boiling and the pressure of vapors. Nevertheless, there remain some particulars which have not yet been considered; in this number are the circumstances which take place during the heating of two liquids contained in the same vessel. M. Gay Lussac was the first to examine those which took place during the heating and boiling of two liquids, which had no action upon each other. He asserts that the temperature of such mixtures is variable; that the lowest temperature at which they can boil is that at which the sum of the tension of the vapors of the two liquids is equal to the pressure of the atmosphere, and that this temperature may rise to the boiling point of the more volatile liquid.

In determining the boiling point of a mixture of different volatile oils, as well as that of carburet of sulphur with water, I have found that the boiling point of these mixtures is always a little more elevated than the boiling point of the more volatile liquid. This temperature is independent of the quantity of the more volatile liquid, and remains constant as long as there is sufficient of this to pass over in drops.

The temperature of the vapor, disengaged from the liquid, was always inferior to that of the boiling liquid, and this

* Journ. de Pog.

temperature remained constant as long as there was a sufficient quantity of the more volatile liquid to pass over, drop by drop. Thus, for example, the temperature, at which newly rectified oil of turpentine mixed with water, enters into ebullition, is 102° C., under the pressure of 749^{mm}.6, whilst that of the vapor is but 94°.5 C. A mixture of carburet of sulphur and water boils at 47° C., under the pressure of 752^{mm}.2; the vapor is but 43°.5 C. As long as any carburet of sulphur could be perceived, these temperatures were constant, and there distilled over carburet of sulphur and water; but when the carburet of sulphur could no longer be seen, the temperature of the liquid and of the vapor rose, and boiling and distillation ceased.

When a mixture of two liquids boils, the temperature should be so high that the vapors of the more volatile liquid may be disengaged freely, and have an expansive force equal to the pressure operating upon them. It is then necessary that the bubbles of the more volatile liquid, as well as that which they carry off with them, should have a temperature equal to the boiling point of that liquid, otherwise vapor would form only at the surface, and there would be no disengagement of bubbles. If this liquid occupies the inferior part, it will be opposed, not only by the pressure of the atmosphere, but by that of the super-incumbent liquid; it should, therefore, take a higher temperature for boiling than under the pressure of the atmosphere. In the case of the liquids upon which I operated, and in which the lower place was occupied by the more volatile liquid, the boiling point of the mixture was very near that at which the more volatile liquid should boil under the increased pressure. Whilst the vapors passed through the less volatile liquid, the space which they occupied acted as empty space, into which the vapors of the less volatile liquid entered; then the vapors of the more volatile liquid expanded, and took a more feeble tension, as the tension which the vapors of the less volatile liquid exercised were weaker. For the formation of the vapors of the less volatile liquid, and for the expansion of the vapors of the

more volatile, it requires a certain heat, from which the vapors of the mixture take a temperature below the boiling point of the more volatile liquid; that is to say, the temperature at which the sum of the tensions of the vapors of the two liquids is equal to the pressure of the atmosphere. Gay Lussac asserts that the upper portion may have a lower temperature; but if we consider the equalization of temperature which should take place at the end of some time, by the ascent of the inferior portion, or by those parts which are carried up by the bubbles to the surface, we can comprehend that the surface should not have a temperature lower than the boiling point of the more volatile liquid. In my experiments, the temperature of the upper portions of the mixture was a little higher than the boiling point of the more volatile liquid, when there was a covering of three inches of water upon a very small quantity of carburet of sulphur.

When we use a still, the vapors of the two liquids pass over at a constant temperature into the refrigerent, and are condensed; but when there does not remain sufficient of the more volatile liquid to pass in drops, the tension of the vapors diminish, and is no longer sufficient to overcome the pressure of the atmosphere. The vapors do not now pass into the refrigerent, and distillation ceases, although some of the vapors of the more volatile liquid still remain.

To know the temperature of the vapor of two liquids which do not upon each other, it is desirable, knowing the boiling point of the two liquids, to find an expression of the temperature at which the sum of the elasticity of the vapors of the two liquids should equal the pressure of the atmosphere. For this it is necessary to know the law according to which the elasticity of the vapor of different liquids change with the temperature; but this law is hardly known for water. In the meanwhile we may suppose that, for temperature near the boiling point, the elasticity of vapors of different liquids are equal, for equal distances of temperature to the boiling point. The temperature at which carburet of sulphur boils, under the mean pressure of the

barometer of 760^{mm}, is 46°.6 C.; the temperature of the vapor which is disengaged from a boiling mixture of carburet of sulphur and water, is 43°.5 C. If we suppose, however, that the elasticity of the vapor of carburet of sulphur at that temperature is equal to the elasticity of these vapors at a temperature 3°.1 C. lower, that is to say at 96°.9 C., we will find, by the tables of Biot, that the elasticity of the vapors of carburet of sulphur at 43°.5 C., is equal to 680^{mm}; the elasticity of the vapors of water, at the same temperature, is 63^{mm}.5. Then the sum of the elasticity of the vapors of the two liquids at that temperature, is 743^{mm}.5. The barometer, during the observation, indicating 752^{mm}.2, then it will be seen that, at the temperature of 43°.5 C., the sum of the elasticities of the vapors of water and carburet of sulphur, is such as to be nearly equal to the pressure exercised upon them; the difference may be attributed to errors of observation. We cannot apply this with the same success to oil of turpentine and water, because, for so great a difference of temperature from the boiling point of the mixture, at 94°.5 C., to that of the oil of turpentine at 156°.8, the elasticity of the vapor of this oil is not equal to the elasticity of the vapor of water for the same difference of temperature, to the boiling point of water.

We might, perhaps, inversely, use the temperature of the vapors of a mixture to determine the elasticity of the vapor of one of these liquids, that of the other being known. It is to be regretted that the number of volatile substances which do not mix, is so small that we can by this mode determine the elasticity of only a small number of vapors, and that, at the most, for a single point of temperature below that of ebullition.

If the more volatile liquid occupies the superior portion, it receives its heat from the liquid which is below, as if it was alone in the vessel. It is striking that there are so few liquids which do not act upon each other, of which the more volatile is the lighter. In my experiments I have only used mercury with water and with the oil of turpentine, and water with the oil of

caoutchouc, but this last changes constantly its boiling point, when it is by itself. The few volatile oils heavier than water have a specific gravity so little different from that of water, that some are carried up in mass by boiling, whilst the others, as the oil of the pinks, becomes at a certain temperature even lighter than water.

The vapors of two liquids which in a state of complete fluidity do not commingle, behave very differently from those which in that state do mix together. It is known that such mixtures constantly change their boiling point, according to the change in proportion between the liquids. The temperature of their vapors is always the same as that of the liquid, and varies with it. But as the temperature of the boiling liquid is always more elevated than the boiling point of the more volatile liquid, the temperature of the vapor will therefore be more elevated than that at which the sum of the maxima of elasticity of the two vapors is equal to the atmospheric pressure. It follows that the vapors of one of the liquids, and probably of both, are not at their maximum of elasticity.

If we introduce a liquid such as ether into the empty space of a barometer tube, and if, after having observed the maximum of elasticity of the vapor at the common temperature, we add another liquid capable of mixing with the ether, such as alcohol, and whose vapor has less elastic force, the elasticity of the vapors of the two liquids will be weaker than that of the ether alone, and it will diminish in proportion as the alcohol is increased; so that with a large proportion of alcohol for the same quantity of ether, the elasticity will be the same as that for alcohol at the common temperature of observation. The same happens if, in place of alcohol, we take the oil of turpentine, and in place of ether the carburet of sulphur, or the oil of caoutchouc, or again, if we introduce first water, then alcohol. In these experiments, which were made at 17°.5 C., there was in the tube so much liquid that a portion remained in a liquid state. If this had not been so, the results would have been very different; for M. Gay Lussac has shown that at a temperature over 100° C., and at which the two are

not at their maximum of elasticity, the space which the vapors of the two mixed liquids occupy is the same as that which the vapor of each liquid would occupy separately. But if we introduce into a barometer tube two liquids which do not mix, the tension of their vapors at each temperature is equal to the sum of the tensions of the vapors of the two liquids.

This difference, which presents the manner in which liquids which mix together and those which do not, behave, cannot depend upon the idea that those which mix form only a single liquid, the vapor of which possesses its own elasticity. For we cannot then comprehend why the vapors of the new liquid should not have the same composition as the liquid itself; but the products of distillation show the contrary. I believe, that which happens in the liquids which mix is owing to a reciprocal attraction between the particles of the two liquids which have this property, by virtue of which one of the liquids in the liquid state attracts the particles of the other, even when the other is in the gaseous state. By this, then, the tension of the vapors of the liquid is diminished, and by so much the more, when there remains a large quantity of the other liquid in the liquid state; the attraction being so much the greater as the attracting liquid is more considerable.

The boiling of two liquids which mix does not depend then solely upon the elasticity of the vapors of each of the two liquids, as that takes place when the liquids do not mix, but likewise on the mutual attraction of the two liquids, which changes with their change of proportion. For a certain proportion of the liquids, boiling commences at a temperature at which the sum of the tensions which each liquid takes, by its attraction for the other, is equal to the atmospheric pressure. If, at this temperature, the proportion of the vapors produced is not the same as that which exists in the remaining liquids, the proportion of the remaining liquid will be altered. This changes the attraction which each liquid has upon the vapor of the other, the proportion of the vapors of each liquid, and the temperature at which the sum of their tensions

is equal to the atmospheric pressure. Hence the temperature of the boiling point continually changes, and will not be constant, except in the case where the quantities of the gas which escape by the boiling hold the same proportion as the liquids which remain behind.

This takes place, for example, in concentrating alcohol by distillation. When we arrive at a certain proportion of alcohol and of water, the quantities of the vapors of the two liquids are in the same proportion as the quantities of the remaining liquids; then whatsoever passes by distillation has the same composition as that which remains; no further concentration of the alcohol takes place. If we add to the mixture some substance very attractive of water, such as potassa or the chloride of calcium, we diminish by this the tension of the vapor of the water; and the temperature remaining the same, the vapors of the mixture consist almost all of the vapors of the alcohol, which alone passes over in the distillation.

In the experiments upon the boiling of two liquids which do not mix, there often takes place strong explosions, when the less volatile liquid occupies the upper part. These explosions are so violent when we boil the volatile oils with water, as to render it necessary to stop the operation to avoid the fracture of the vessel. If we introduce the bulb of a thermometer into the inferior liquid, but as near as possible to the surface of junction of the two liquids, the thermometer will be seen to rise immediately before the explosion. The liquids are then perfectly tranquil, they do not boil, there is no distillation, and the superior forms a continuous mass upon the top of the inferior liquid. In this state the thermometer often takes a temperature of 3°, 5°, or even 10° C. above the boiling point of the mixture. Suddenly an explosion takes place, the upper mass is broken, a great quantity of vapor is disengaged, and the thermometer falls to the temperature of ebullition of the mixture, at which it remains as long as the vapors of the inferior liquid can freely escape through the superior.

It thus appears, that the coherence of the particles of the upper liquid may be so great as to hinder the formation of

the vapors of the inferior liquid, even when the temperature of the latter is many degrees above the ordinary boiling point, and under the same pressure. The lower liquid takes this elevated temperature because the vapors which it produces cannot escape; but by degrees the tensions of the vapors become so great, that they break with violence the coherence of the particles of the upper liquid, and thus produce the explosions.

When we place in the mixture wires of platinum or of iron, the explosions do not take place, even when the upper liquid is thick and viscous oil of turpentine, which can hardly be raised to the boiling point without the wires. The effects of the platinum wires is so much the more curious, since they totally prevent the appearance of the explosions, even when they are wholly within the lower liquid, without extending at all into the upper. It, however, requires great care in introducing these wires into a liquid heated to near the boiling point, because it then occasions a violent ebullition, which quickly throws the liquid out of the vessel.

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ART. XXXIX.—A LAMP FORMED WITH FILAMENTS OF ASBESTUS; DIFFERENCE IN THE LIQUIDS OBTAINED BY THIS APPARATUS WITH ALCOHOL, SULPHURIC ETHER, &c. By M. R. Böttger.*

The lamp of M. Böttger consists of a common spirit of wine lamp, in which a wick, formed of long filaments of asbestus, is substituted for the cotton wick. The upper part of this wick is spread out as much as possible; this is easily done by drawing out, one by one on every side, the filaments of asbestus. This spread portion is to be moistened with ammoniated hydrochlorate of platinum, made into a thin paste by means of alcohol, so that the whole wick may appear perfectly impregnated; this part is then to be heated red hot by a lamp. The lamp being filled with ether, alcohol, or any analogous liquid, is to be placed upon a small support on an iron tripod, the whole to be covered by a cylinder of glass, eight or twelve inches in height, and three to four in diameter at the bottom, with the edge turned in; the part of the wick covered with platinum entering about one inch within the lower part of the cylinder. To this tube is to be attached hermetrically the glass vessel destined to receive the condensed liquids. By the aid of three of these contrivances, M. Böttger obtained, at the end of twenty-four hours, by cooling the upper part of the cylinder, several ounces of liquid; the finer the filaments of the platinated asbestus are, the greater is the power which they exercise.

The author has submitted absolute alcohol, the sulphuric, nitrous, and acetic ethers, to the action of this apparatus, and has obtained different liquids from each of these compounds.

A.—*The liquid obtained from absolute Alcohol.*

The alcohol which he used had the specific gravity of .793, that of the liquid obtained was .984. This was without color

* Archiv. der Phar., vol. xiii.

or disagreeable odor; resembling, somewhat, very weak alcohol, it had no taste, or acid, or alkaline reaction; submitted for some time to ebullition, with concentrated sulphuric acid, it was not discolored. The nitrate of silver did not produce, even with the aid of boiling, any cloud or color; treated by a hot solution of chloride of gold, there was no reduction of the metal; however much it might be heated beforehand, the approach of flame did not cause combustion. It was formed principally of water, holding in solution a trace of alcohol; for, when an excess of dry carbonate of potassa was added, a thin film of alcohol formed on the surface, which easily inflamed on the approach of a light. As this liquid does not form saline combinations with any base, it does not merit the name of an acid; but a different result is obtained by using platinum black for the combustion, or incomplete oxidation, in place of this asbestus lamp, or of platinum sponge. It then produces, as other chemists have for a long while remarked, a true acidification; but the acid product is of a different nature from those obtained by the aid of the apparatus of M. Böttger from sulphuric, acetic, and nitrous ethers; the odor alone is sufficient to point out the difference.

B.—*The acid from Sulphuric Ether.*

The liquid obtained from sulphuric ether, of the specific gravity of .7251, weighed 1.027. It is without color and has a very acid reaction. Its odor is extremely pungent, strongly affecting the olfactory nerves and the eyes, especially if slightly heated. The solutions of nitrate of silver and chloride of gold do not trouble it; but after boiling for some time, the silver and gold are reduced, covering (the gold especially) the whole interior surface of the vessel with a polished metallic film. If it be boiled with a solution of chloride of platinum, the reduction of the platinum is perceived but at a few spots on the internal surface of the vessel; but this reduction takes place almost instantaneously, if, while heating, a few drops of liquid ammonia be added; all the

platinum separates under the form of platinum black. The acid from sulphuric ether *dissolves completely*, by the aid of heat, the deutoxide of mercury; and when this oxide has been used in excess it is changed into a body, *as white as snow, in the form of thick flocculi*, and which has much resemblance in its external characters to the acetate of the protoxide of mercury. By the addition of an equal volume of sulphuric acid at common temperatures, it was neither clouded or discolored, but, on the mixture being heated, it became of a deep yellow, but without any true carbonization. The vapors disengaged by heating it with sulphuric acid, had an extremely penetrating odor, much resembling that of concentrated formic acid, and strongly affecting the olfactory nerves and the eyes. If it is boiled with a solution of the chloride of mercury, much calomel is separated, of a snow-white color, with a trace of metallic mercury; if a little of the solution of iodide of potassium be now added, iodide of mercury is formed, which, by the addition of a large quantity of the iodide of potassium, is re-dissolved, forming a deep yellow solution; the same phenomena do not take place, as we have seen, with the acid from nitrous ether submitted to the same treatment. The acid from sulphuric ether disengages, with rapid effervescence, carbonic acid from the carbonate and bicarbonate of soda.

C.—*The acid from Nitrous Ether.*

The nitrous ether employed in these experiments, was recently prepared, agitated with a weak solution of potassa, and then rectified from chloride of calcium; it was totally free from acid, and had, at 17° R., the specific gravity of .877. To obtain the acid from this ether, it is necessary to take care not to spread the asbestus wick too much, because the nitrous ether takes fire with great facility by contact with the red hot filaments of the asbestus; this phenomenon does not take place so easily with the other species of ether. The acid from nitrous ether is without color; its odor is like that of the acid from sulphuric ether, resembling, nevertheless, that of

nitrous ether. In its preparation, there is commonly seen a deposition, upon the interior of the glass cylinder, of a small quantity of a resinoid substance, of a yellowish white aspect,—as Daniell has already observed. This acid offers a very acid reaction; added in equal parts to sulphuric acid and heated, it becomes of a pale yellow color, less deep than that of the acid from sulphuric ether under the same circumstances. When we boil it with a solution of chloride of gold in a glass vessel, the interior surface does not become coated with a pellicle of gold, but all the metal is precipitated in an extremely divided metallic state. Submitted to ebullition, with an aqueous solution of chloride of platinum, the metal is not reduced; but, if a few drops of ammonia be added, and the heating continued, a small quantity of ammoniated hydrochlorate of platinum separates without any reduction of the metal, even after a prolonged boiling. When it is boiled for a long time with deutoxide of mercury, the greater part of this oxide is reduced to the state of metallic mercury, recognisable partly under the form of a thin gray pellicle, on the surface of the liquid, and partly under that of gray globules, extremely divided; but another portion of the oxide gave, by solution, a colorless liquid, from which hydrosulphate of ammonia precipitated sulphuret of mercury, and a solution of iodide of potassium, the protiodide of mercury, of a beautiful yellow color, a difference which distinguishes it from the acid from sulphuric ether. When it is boiled with a solution of nitrate of silver, all the silver is separated in a metallic state. The same treatment, with *a solution of chloride of mercury*, produces the separation of a very great quantity of protochloride of mercury, and a little metallic mercury; if, after this separation has taken place, a solution of iodide of potassium is added to the hot liquid, the red iodide of mercury is formed, which is re-dissolved by the addition of a greater quantity of the iodide of potassium; the solution is not then yellow, but is without color. Although the acid from nitrous ether offers, as has been said above, a very acid reaction, the addition of a solution of carbonate, or even of

bicarbonate of soda, does not produce *the least effervescence, or any disengagement of carbonic acid*, even when the mixture is slightly heated.

D.—*The acid from Acetic Ether.*

This was prepared with an acetic ether free from acid, the specific gravity of which was .876; it weighed .992; it was colorless; its smell is not disagreeable, nor so penetrating as that of the two preceding acids, it resembles that of acetic ether. It reddens the paper of tournsol; it remains *totally colorless*, when boiled with an equal volume of concentrated sulphuric acid; it did not separate the gold from a solution of chloride of that metal at the boiling temperature; lime water and acetate of lead had no action upon it. Submitted to a long boiling with a solution of chloride of platinum, this latter was not reduced; the addition of a few drops, or even an excess, of ammonia to this liquor, did not cause, in either case, the formation of the yellow precipitate of ammoniated hydrochlorate of platinum, as was observed with the acid from nitrous ether, under similar circumstances. When boiled with deutoxide of mercury, there was not a trace of reduction; nevertheless, the filtered liquor gave, with hydrosulphate of ammonia, a precipitate of sulphuret of mercury. The solution of nitrate of silver produced, in this acid, an abundant white cloud, and at the end of some time, a grayish white flocculent precipitate, which formed more promptly when the liquid was heated slightly. Liquid ammonia readily dissolved this precipitate. This acid, boiled with a solution of chloride of mercury, did not cause the separation of calomel or of metallic mercury; the liquid remaining clear. Mixed with bicarbonate of soda, it did not cause *any disengagement* of carbonic acid, even when the mixture was slightly heated.

M. Böttger thought that this small number of experiments gives very probably the whole difference which exists between the acids of the ethers; however, he proposes, for the purpose of obtaining in this subject a more complete certainty, to

make comparative experiments on the salts prepared with these acids, and to communicate the results which he obtains.

A. G. V.

Journ. de Pharm.

ART. XL.—REPORT MADE TO THE ROYAL ACADEMY OF MEDICINE UPON THE NEW FERRUGINOUS PILLS OF M. VALLET. Soubeiran, Reporter.

MM. Planche, Martin Solon, and myself, have been commissioned by the Academy, to draw up a report upon the new ferruginous preparation which M. Vallet presented to it, in February, 1837.

Its base is carbonate of the protoxide of iron. M. Vallet proposes to make a preparation stable, and always constant in its composition from this salt, which is remarkably unstable.

The carbonate of iron, for medical purposes, has advantages which are not possessed to the same degree by other ferruginous preparations. It has not a strong cohesion, or feeble affinities, which present an obstacle to its solution, as is the case with the oxides of iron. The oxide at the minimum is a powerful base, and the carbonic acid which is associated with it can be displaced without difficulty by the acids contained in the digestive passages. This facility of decomposition gives it equally the advantage over the other insoluble salts of iron; and there is no ground to fear that it traverses the canal without producing the effect. On the other hand it is often preferable to the more soluble salts; for its solution by the acids of the stomach is slow and gradual, and gives rise to little apprehension that the disagreeable and dangerous styptic impression of the salts of iron will be produced.

The employment of the carbonate of the protoxide of iron in medicine is not new; nearly all the formulæ proposed for its administration have for their base a mixture of the sulphate

of iron and carbonate of potassa, which by double decomposition affords sulphate of potassa and carbonate of iron. Such for instance as Griffith's pills, adopted by the London Pharmacopœia, the emenagogue pills of the Spanish Pharmacopœia, and the pills prepared according to the more recent and better known formula of Dr. Blaud de Beaucaire. These formulæ are rational, in despite of what has been said of them, by the author of the *Pharmacopée Universelle* who has not perceived that the chemical decomposition was foreseen and essential to the nature of the medicine. M. Vallet assures us that, at the moment that they are made, these preparations contain sulphate of potassa, carbonate of potassa, and carbonate of iron, but that the last, although enveloped in a consistent mass, does not escape its habitual decomposition, as the oxygen of the atmosphere converts it by little and little into an hydrated peroxide of iron.

We have exposed to the air, the recently made pills of Blaud, forming a sheet three lines thick. At the end of three days, a dry and ochreous layer was formed upon its surface. The protoxide of iron had completely disappeared; the water separated it from the sulphate, carbonate, and bicarbonate of potassa; by means of the last named salt, there was held in solution a little of the protoxide and some traces of the peroxide of iron; this metal was almost entirely converted into an hydrated peroxide. The lower layer, still soft, had not as yet undergone so decided an alteration. The carbonate of iron in this part was observed in considerable quantity, but the rust color of the mixture exhibited the advanced degree of oxidation it had undergone. There is wanting, then, to the formula of Dr. Blaud, as to that of which it is an imitation, the stability which is an essential character of a good medicine; it is not on the next day what it was the day previous; its composition changes with the age of the preparation.

Griffith has proposed, under the denomination of a mixture, a preparation that differs from the preceding; in as much as the two salts are decomposed in an aqueous vehicle, the reac-

tion is essentially of the same nature, but the sur-oxidation of the iron takes place slowly on account of the sugar which Griffith has introduced into his formula, relying certainly upon the obstacle it would present to the absorption of oxygen.

In a formula very similar to the preceding, other practitioners have substituted the bicarbonate for the carbonate of potassa; there result, in consequence, marked changes in the nature of the medicine. When two solutions are mixed, one of sulphate of iron, the other of bicarbonate of potassa, a precipitate is obtained, similar to that which is furnished by the simple carbonate, but it is less abundant; the nature of the supernatant liquid is entirely different; it contains protoxide of iron in abundance, doubtless in the state of double carbonate.

An analogous action is produced when a pillular mass prepared with the same ingredients is dissolved in water; but these pills like the others, soon experience the destructive effects of the atmosphere, they are hardly made before a greenish tint announces a change, and very soon an ochreous color pervades the whole mass. We have examined a mass which has been left for five days under the form of a cake, a line thick, and have found that the protoxide of iron had entirely disappeared; with water, a colorless solution was afforded which contained but small quantities of iron.

A more successful administration of carbonate of iron results from the solution of this salt by carbonic acid, either in the natural or artificial mineral waters; the last, in consequence of the great excess of acid with which they are charged, more completely secure the solution of the carbonate; but those who are well acquainted with these kinds of preparations, know also with what difficulty the iron is prevented from oxidation, and have witnessed its transformation into a peroxide; the carbonic acid can no longer hold it in solution, it precipitates in reddish flocculi. This effect is inevitable, when the bottles have been uncorked and the atmospheric air has had access.

Next in order comes the formula published two years since

by Menzer, who, associating the sulphate of iron and bicarbonate of soda, each separately with sugar, mixes the two salts at the moment of exhibition, and thus prevents ulterior oxidation. This method appears to us truly valuable, only that it does not unite the agreeable with the useful; it does not disguise from the patient the disagreeable impression produced by the acerb taste of the salt of iron.

The first idea of preventing the oxygenation of carbonate of iron, and affording a medicine constant in its effects, is to be attributed to Dr. Becker. It has been carried out in practice, by M. Klauer, pharmacien of Mulhausen. He made use of sugar as a preservative from oxidation. M. Klauer rapidly prepares the carbonate of iron by double decomposition, taking care not to employ aerated water, both for the solution of the salt and to wash it; he mixes the humid carbonate with the sugar and evaporates to dryness: this was a point gained, but the end was not yet attained. The ferruginous sugar of M. Klauer, had a blackish green color, which too plainly evinces the effects of oxidation; this, however, does not attain its utmost limit; the ochreous color of the isolated peroxide is never perceived. What was wanting to M. Klauer, has been obtained by M. Vallet. As had been done by M. Klauer, M. Vallet employs sulphate of iron, prepared according to the method of Bonsdorff, which affords a salt of a bluish tint, entirely free from the peroxide. Like M. Klauer, he also has recourse to a sugary substance to prevent oxidation, but he substitutes honey for sugar, and we shall now see what advantages result in the quality of the product.

M. Vallet dissolves the sulphate of iron and carbonate of soda in a solution of sugar, and washes the precipitate with the same, in a linen rag impregnated with syrup; he then drains the carbonate of iron obtained, and mixes it with the honey, evaporating, by means of a salt water bath, to the pillular consistence. Thus, in the operation, the preservative sugary substance is always in contact with the ferruginous salt. The practice has been crowned with complete success; the carbonate underwent all the unfavorable changes of long

manipulation, and yet it was found in the product in the same state as at the moment of formation.

Honey has here an indisputable advantage over sugar; in the first place, it more certainly prevents oxidation,—besides, as it never takes on the solid form, it more completely envelopes the ferruginous matter, and preserves it throughout from the influence of oxygen. The carbonate itself, in the midst of this humid mass, does not cohere, but remains highly soluble in acid liquids.

We shall now report, in detail, both the method of M. Bonsdorff for the sulphate of iron, and that of M. Vallet for the preparation of the ferruginous pills.

To prepare the sulphate of iron by the method of Bonsdorff, commence by dissolving pure iron filings in pure diluted sulphuric acid, by the aid of moderate heat; this mixture is poured into a glass matrass with a long neck and an opening of small diameter, in order to avoid, as much as possible, the entrance of air; a little iron filings in excess is added, and the solution is boiled until it will no longer dissolve the iron, which is determined by the liquid assuming a peculiar deep brownish gray color. When the solution is sufficiently concentrated to be disposed to crystallize, it begins to foam, and it is requisite to manage the heat with great caution. To filter the liquid, a funnel is selected with a beak as narrow as possible; and, when the filter is moistened with water, the solution is poured into it, and received into a glass capsule previously moistened with a little sulphuric acid. In fact, this small excess of sulphuric acid entirely prevents the still further oxidation of the iron, and the filtered solution remains perfectly clear; while, on the contrary, without the addition of the acid, it immediately becomes turbid, or deposits pellicles, and soon after, a precipitate of hydrated oxide,—which, as is well known, assumes a color at first of a grayish green and afterwards a yellowish brown, (by forming a basic salt.) It is also necessary, in consequence of the turbidness, to bring down the beak of the funnel to the bottom of the vessel, because, however little the distance between them, the

fall of the liquid through the air is sufficient to produce it. The quantity of sulphuric acid necessary, is very small, about a drop, or a drop and a half, to each ounce of the concentrated boiling solution, is more than sufficient; and it is useful, also, to moisten the beak of the funnel externally with the acid, because, if this be not done, the liquid becomes turbid around it. It is equally necessary to agitate the solution from time to time, so that the sulphuric acid may be uniformly mixed through it.

Upon cooling, the salt crystallizes, and it can be obtained at will, in large or small crystals; it is much more advantageous to have it in small crystals, because it is easier to dry, and also dissolves more readily in water. In this case the solution, while crystallizing, is disturbed by slight agitation; and, if the liquid be cooled by ice, a greater quantity of crystals are obtained. The crystals are finally placed upon filter paper in a funnel; as soon as the liquid has drained from them, they are exposed upon unsized paper and covered with the same, pressing the paper down upon them; this is done several times, until the salt is perfectly dry.

The following are the properties of the pure salt obtained in this manner. Its color is not green or bluish green, as is generally the case with this salt, but rather blue, approaching somewhat to green; it is of the beryl blue shade,—less green than the stone known as *aqua marina*. Should it assume a green color, or become more green than blue, it can be pronounced with certainty that it already contains a sesquioxide; the color is, in fact, the most sensible test of purity in this respect; and the best mode of determining this is to compare it with the pure salt. When effloresced in dry air, a white powder is formed, as pure as that of chloride of mercury in powder. But with time, at the end of several weeks for example, the color commences to pass gradually to a light yellowish green. If this powder is then dissolved in water, the solution is rendered a little turbid by an ochreous deposit, which is, as is known, the basic sulphate of the sesquioxide of iron, indicative of decomposition produced by the air.

If it be attempted to crystallize the sulphate of iron from a neutral solution, the salt upon the surface is rapidly decomposed by contact with the atmosphere; a few hours, or a day, are sufficient to communicate a dull green color which soon becomes of a deeper green, and which results from a mixture of the blue with a yellowish brown color, of the basic combination, the product of decomposition.

Let us pass now to an exposition of the method pursued by M. Vallet to obtain the new ferruginous preparation:

℞.—Sulphate of iron, (Bonsdorff's,)	500	grammes.
Pure carbonate of soda,	588	"
Very pure white honey,	306	"
Syrup,	qs.	

On the one hand, dissolve the sulphate of iron in a sufficient quantity of warm water deprived of air and sweetened with an ounce of syrup to the pound; on the other hand, in the same manner, dissolve the carbonate of soda; filter the two liquids separately; mix them in a flask of such capacity that the mixture shall fill it almost entirely; the flask is stopped by a glass stopper; it is shaken and then allowed to deposit the carbonate of iron resulting from the reciprocal decomposition. When the precipitate has subsided, the supernatant liquid is decanted, and fresh warm water is poured on, previously deprived of air, and sweetened. This is repeated until the absence of a saltish taste in the washings indicate the entire removal of the sulphate and carbonate of soda. The precipitate is then thrown upon a drainer saturated with syrup, squeezed forcibly and then mixed with honey, the mix ture is then fluid, and the carbonate of iron is readily incorporated; placed in a water bath, it is concentrated to the pillular consistence with as much expedition as possible, and then preserved, abstracted from contact with the air.

The pills, to which we shall attach the name of the author, are prepared, if it be necessary, by adding to the preceding mass a sufficient quantity of inert powder. They do not become dry, and never harden.

Each pill contains 1.3 grains of carbonate of iron, or 0.3 grains of protoxide; ten pills represent thirteen grains of carbonate, or eight grains of protoxide.*

The committee have scrupulously repeated the experiments of M. Vallet, and found them exact. The following advantages are possessed by the formula:

1. Because it affords the means of administering the protocarbonate of iron in constant doses, without fear of the medicine changing in the course of use.

2. Because the form that has been chosen prevents the disgust induced by the acerb taste of salts of iron, and especially because the excipient is very soluble, and secures the action of the medicinal base.

It remains to determine what is the medicinal value of carbonate of iron employed under this form. Let us see the summary of results obtained by one of the committee.

We have employed the ferruginous preparation of M. Vallet, in pills, in the cases of seven chlorotic patients, aged from fourteen to twenty-five years, presenting the peculiar palor of this disease, the palpitations and the bruit de soufflé of the carotid arteries, the throbbing of the head and the feeling of debility which such patients complain of, the oppression which overcomes them, the feeble digestion and want of power of the muscular system which is always observed. The youngest of these patients had not menstruated, the others were irregular, or deficient in the menstrual secretion.

None of them exhibited hysterical symptoms. The dose of the ferruginous preparation was carried, in all, to ten pills daily; they were always easily taken by the patients. So far from disturbing the digestive functions, these were rendered better and more active by them, and they never produced the developement of gas which often accompanies the use of iron filings, or subcarbonate of iron. In the youngest

* A small quantity of iron is in the state of a soluble salt, in combination with the acid always contained in the honey.

of the patients, whom this last substance disagreed with, the pills of M. Vallet were easily digested, and their use was followed by marked amelioration. In all, the heart lost its tumultuous and irregular movement, and resumed its normal pulsations. The sound of the arteries ceased, as well as the throbbing of the head and the disposition to syncope, at the same time the capillary system became injected, and the lips resumed their vermilion color. These favorable modifications were suspended a long time in one of the patients whom we had bled.

"The courses were restored in five of these patients, they had not yet been established in the one of fourteen years, and did not return in the one we had bled.

"From one hundred to three hundred pills were administered to our patients, in from twelve days to a month, and were sufficient to produce an improvement or cure, as we have reported.

"It is as well to remark here, that the most protracted treatment did not require more than three hundred pills, or a little more than three drachms of carbonate of iron, which furnished an evident proof of the good state of the iron in the pills,—since we are forced to administer much larger doses of other ferruginous preparations.

"It results from our experience that the new preparation can be administered easily in the dose of ten pills daily; that this dose, which can be exceeded, suffices to produce the modification of the blood and of the economy which is desirable in chlorosis; that, so far from deranging the digestion, this preparation facilitates it, acts favorably upon menstruation, and the results which it affords, appear to be more readily obtained than from the greater number of other ferruginous preparations."

Before concluding, we think it necessary to report two observations made by M. Vallet, since presenting his memoir, which are interesting in the medical history of chlorosis:

"M. Vallet has found a little iron in the urine of females in health. He has found a much greater proportion in the

urine of a female laboring under chlorosis, before any treatment; but when the patient had made use of the pills of iron, and when the progress of the disease towards cure had been established, he observed that the iron was diminished in the urine, without the proportion having returned to the natural state. If new analyses should confirm the first observation, they would show that, in proportion as the blood becomes impoverished, one of its essential elements, iron, is eliminated by the urinary passages.

"The second observation refers to the passage of iron into the milk; M. Vallet, who did not find iron in the milk of women in health, has observed it in appreciable proportion and by the same chemical means, in the milk of a woman placed under treatment with carbonate of iron. This fact may be of some importance in the treatment of infants at the breast; it is still a single one, and calls for new trials; yet we can assure the Academy, that MM. Henry and Chevallier have given the ferruginous preparation to she-asses, and have ascertained that the iron passed into the milk.

To conclude: chemico-pharmaceutic observation is favorable to the new preparation of M. Vallet, presented to the Academy; and medical observations, although as yet few, also promise happy results.

Journal de Pharmacie.

ART. XLI.—CHEMICAL EXAMINATION OF RASPBERRIES, (FRUCTUS RUBI IDŒI). By L. F. Bley.

From the researches of M. Bley, raspberries are composed of—

Essential oil,
Citric acid,
Malic acid,
Red coloring matter,
Crystallizable matter,
Water,
Insoluble mucilage,
Vegetable fibre.

The ashes of this fruit contain—

Carbonate, Phosphate, Hydrochlorate } of potassa,
Carbonate, Phosphate } of lime and magnesia,
Silica,
Oxide of iron.

The most interesting principle is assuredly that which constitutes the aroma of this fruit, which M. Bley attributes to the essential oil. The following is the method which he has pursued in obtaining it, a mode which he has also employed successfully in procuring that of the apricot:

A certain quantity of ripe raspberries, about thirty pounds, after the expression of the juice, were submitted to distillation with water; a saturated product was obtained, which, by long repose, allowed a large quantity of small flocculi of a concrete volatile oil to separate; one portion floated upon the surface, while another fell to the bottom. After having been collected with the greatest care upon a paper filter, they presented

themselves adherent to the paper, from which they could not be detached without much loss. The filter was then sprinkled and exhausted with ether. The ethereal liquid, evaporated by the warmth of the hand, or by exposure to a moderately elevated temperature, left a small quantity of an aqueous liquid, containing particles of essential oil, under the the form of small micaceous scales, a part of which floated, while the other fell to the bottom; a fact that seemed to indicate a difference in specific weight, as is observed in the case of the essential oils of different vegetables, the oil of cloves for example. Upon the sides of the capsule, in which the ethereal solution was exposed, a circle of a greasy resinous substance was observed, of a yellow green color, which appeared to be chlorophylle and must have come from portions of the calyx, adherent to the fruit and which had been carried over by distillation. The essential oil was examined as far as its small quantity permitted; with that still in combination with the water, it might be estimated at about five grains; it exhibited the following properties: It is soluble in ether and alcohol, and communicates to them the well-marked odor and taste of raspberries. It is soluble in water, as is seen in the preparation of raspberry water. It is equally soluble in ammonia and caustic potassa, without saponification; heated with the solution of this last alkali, it exhales the odor of violets.

Cold concentrated sulphuric acid, just produces a feeble yellow coloring, without destroying the odor of raspberries; when heated, a brownish violet color is observed, and a disengagement of sulphurous acid. The red coloring matter of raspberries is similar to that found by Berzelius in red fruits, and in leaves which have become red in autumn.

A. G. V.

Archiv. de Pharm., and Journ. de Pharm.

ART. XLII.—FECULA OF THE SAW-PALMETTO, USED BY THE INDIANS AS FOOD.

(*From the American Medical Intelligencer.*)

We are indebted to the gentleman to whom it is addressed, for the following letter from General Smith. Mr. Roberts has also favored us with specimens of the flour, the color of which sufficiently indicates its impurity, and will doubtless account for the unwholesome effects it is said to induce.

It is an impure starch prepared after the method described in the following letter.—Ed.

Philadelphia, July 14th, 1338.

Charles Roberts, Esq.

Dear Sir,—I beg you to accept a quantity of a flour used by the Seminole Indians of Florida as food.

This flour is made from the root of the saw-palmetto,* and has been used by the Indians since its discovery, within about eight years, as a substitute for a much better article of food made from the arrow-root. The latter is only found on the eastern coast; the saw-palmetto covers nearly all the territory south of latitude 28°, where it is not under water. The flour made from the arrow-root is called *coontie;* this and another substitute, made from the root of the India brier, usually bear the same name.

The root of the saw-palmetto lies generally on the surface of the ground, shooting down its fibres from the under side, and one end into the earth; the other end turns upwards, and from it proceed the dentated stems of its leaves; these generally shoot quite close to the ground, but often, in the older plants, a stem from two to eight feet long, apparently of the same nature of the root, and a continuation of it, intervenes between the earth and the leaves. This stem is the part chosen for their food, and is generally from four to ten inches in diameter.

The outer part, which is always found scorched by fire, is cut off, and the remainder chipped up as logwood is for the

* *Chamærops serrulata.*

dyer. The chips are pounded in a mortar cut out of the nearest log of hard wood found lying on the ground, with a pestle about six feet long, and then passed through a sieve made of strips of palmetto leaves—a fabric similar to that of the "palm hats" sold here; the coarser fibres remaining are thrown away.

A piece of cotton cloth—generally a cotton handkerchief—is then tied by its corners, at about three feet from the ground, to stakes set in a square about eighteen inches apart; underneath and near the ground a deer skin is tied to the stakes in the same manner, its corners gathered so as to enable it to hold six or eight gallons of water. Into the upper cloth is then put a quantity of that part of the root passed through the sieve, and water is poured upon it by one person, while another stirs it around and mixes it up with the hands. The water passing through the cloth carries with it all the finer farinaceous particles, and is received in the deer skin below. When the latter is full the flour is allowed to settle, and a starch-like substance is deposited, which is then poured off.

After throwing away from the cloth the residue left in it, it is washed and replaced, and the deposit left in the deer skin removed to it; when it is suffered to drain completely. It is then spread out on a dry skin on the ground, and all the lumps are broken and thoroughly dried; it is now packed in bags of dressed deer skin ready for use.

It cannot well be made into bread, but is used in a kind of pap, or to thicken a soup, if they have meat. It is sometimes, also, fried as batter cakes.

The Indians do not consider it a wholesome diet,—it is productive of bowel complaints.

The whole labor of gathering the root and preparing the flour, which is considerable, from the force necessary in pounding it in the mortar, is performed by the females.

There is a difference of color in the two parcels I send you. The roots from which the whiter flour was made were drier than the others.

Your obedient servant,

PERSIFOR F. SMITH.

ART. XLIII.—A SIMPLE METHOD OF COMPLETELY DECOLORING, WITHOUT DISTILLATION, THE OIL OF PETROLEUM OF COMMERCE. By M. R. Böttger.

To two pounds of ordinary oil of petroleum, contained in a glass flask, are added about six ounces of fuming sulphuric acid, and the flask is closed; the mixture is agitated several times daily and for many days. At the end of about the eighth day, the oil will have become colorless, and all the organic matter, that has been in union with it, will have been carbonized by the sulphuric acid.

At this time the flask is to be opened, taking care not to inhale the fumes of the sulphurous acid which are disengaged in quantity; by means of a syphon, the oil is decanted into another flask, where it is several times agitated with water, which is frequently renewed; after having been allowed to remain at rest for a time, it is poured into a third flask, and three ounces of quick-lime in fragments added; it is then carefully shaken several times, and again allowed to remain for a period at rest. The oil purified by this method is perfectly colorless, and well fitted for the preservation of sodium and potassium, which, when retained in it, remain for years without oxidation.

This method has been tried by M. F. Mohr, and has perfectly succeeded. A. G. V.

Annalen der Pharmacie, and Journ. de Pharm.

ART. XLIV.—SOLUBILITY OF THE DEUTOXIDE OF MERCURY IN WATER. By R. F. Morehand.

The opinion expressed by some chemists, and especially by Donovan, Guibourt, and Thomson, that the deutoxide of mercury is slightly soluble in water, is contradicted by others, especially by Ure. We may presume that the first named chemists may have employed an oxide not entirely free from nitrate, which salt ought certainly to cause a partial solubility of the preparation. The most simple mode to resolve this question would be to employ the *precipitate per se*, that is to say, the red oxide of mercury, prepared by the action of heat upon pure mercury; but this oxide is no longer prepared, and it is very difficult and tedious to obtain it for one's self.

Some deutoxide of mercury, perfectly pure, which I had prepared for this purpose, was heated strongly, constantly stirring it, so that a great part was decomposed into metallic mercury and oxygen; I then supposed that I had decomposed all the nitrate which it contained.

The oxide thus treated was boiled in distilled water, and the decanted liquor was filtered. This liquor was very evidently colored brown by hydrosulphate of ammonia. This still took place, even after the oxide had been subjected to twenty successive ebullitions, and finally treated with a boiling solution of caustic potassa, and then carefully washed. There was always observed the brown color with hydrosulphate of ammonia, and the green with the syrup of violets, of which the before named British chemists had spoken. These reactions could not be derived from a solution of a mercurial gas in the water, as had been pointed out by A. Wiggers, since they should then be different in their nature, and likewise because the quantity is too small, as the researches of Wiggers prove.

NOTE ON THE ABOVE, BY M. F. BOUDET.

The experiments of M. Marchand appeared to me to have demonstrated the solubility of the deutoxide of mercury in

water; nevertheless, that no doubt might remain of the fact, I wished to confirm it by acting upon some *precipitate per se*, previously prepared by M. Deyeux, and which I had preserved in the matrass in which it had been formed by the calcination of mercury. A certain quantity of this oxide, reduced to a fine powder, was shaken up with distilled water, at the temperature of 10°. The filtered liquor changed to green, in an unequivocal manner, a very dilute solution of syrup of violets; but was completely insensible to hydrosulphate of ammonia. Boiling water, on the contrary, was so much charged with the oxide, that it changed the syrup of violets strongly green; it restored to blue the red paper of tournsol; it was changed brown by the hydrosulphate of ammonia, forming a precipitate which, at first, was suspended in the liquor, but afterwards subsided to the bottom of the vessel in black flocculi.

I do not think, after these observations, that any one will dispute the fact, that perfectly pure deutoxide of mercury is slightly soluble in distilled water.

Journ. de Pharmacie.

MISCELLANY.

Sophisticated Opium.—At the meeting of the Societé de Pharmacie, of Paris, held May 2, 1838, M. Dubail presented a specimen of opium resembling that of Smyrna, a considerable quantity of which had been introduced into commerce at Paris and Havre, many cases having been seized at the instigation of the School of Pharmacy. This opium does not exhibit the least trace of morphia. It is in rolls, well covered with leaves, has a blackish section, and a slightly elastic consistence. It becomes lactescent upon contact with water. The aqueous and alcoholic solutions are neutral to test papers, and are not precipitated by ammonia. Its odor and taste are analogous to those of ordinary opium, although feebler. It has been adulterated with so much skill, that the reputed inimitable character of transparent agglutinated tears appears even under a magnifier, so that this character, hitherto regarded as decisive in detecting pure opium, from the above occurrence, loses all its value. This vitiated product has been, as appears, imported from England; and the fraud explains the low price for which morphia and its salts are there sold. M. Dubail, feeling authorized by the serious consequences to patients, attendant upon such falsifications, requested that a committee be appointed to present a petition to the Chambers, to enact severe laws against the falsifiers of substances destined for medical use.

Journ. de Pharmacie.

Note.—We are informed that the same article has been imported into the United States, and has been met with by a respectable house in New York. The account given of it from the *Journ. de Pharmacie*, will put every druggist on his guard in purchasing opium.—Ed.

On the condensation of Chlorine, by M. Mohr. (*Ann. der Phar.*)—To condense chlorine into the liquid state, M. Mohr directs bisulphate of potassa to be fused, pulverised, and intimately mixed with chloride of sodium and peroxide of manganese. Fill the branch of a curved glass tube two-thirds full: this tube should be very long and strong. Heap on the top of this mixture about the thickness of two inches of chloride of calcium; the tube is now to be hermetically sealed at the other extremity. The tube is to be introduced into a gun-barrel, with some sand, and heated in a chemical furnace. There will soon condense in the smaller arm of the tube, a considerable quantity of perfectly dry chlorine, characterized by its orange yellow color, without any shade of green.

Ann. des Mines.

Upon the composition of Beeswax, by M. Hess.—(*Repert de Ch.*)—When we treat virgin wax of Russia by cold ether with frequent repetitions, there remains pure white wax, which is hard and brittle, and fuses between 64° and 65° C.; I have found this to be composed of—

Carbon,	0.8084	20 at.
Hydrogen,	0.1322	40 "
Oxygen,	0.0594	1 "

On washing the ethereal solution until it is deprived of color, what remains is still pure wax. These facts prove that wax is not composed, as has been believed, of two different substances, the one very soluble in alcohol, *cerin*, and the other but slightly soluble, *myricin*. The results of my analysis approximate closely to those obtained by Saussure, and to those given by M. Boussingault, for the wax of the *Ceroxylon andicola*.

But M. Oppermann has obtained for the wax of Japan, and for that of Brazil, a different composition, namely :

	Wax of Japan.	*Wax of Brazil.*
Carbon,	0.7097	0.7289
Hydrogen,	0.1207	0.1203
Oxygen,	0.1096	0.1509

For my part, on treating the fecula of rye by nitric acid, I obtained, besides oxalic acid, a fatty substance like wax; soluble in alcohol, and still more so in ether; capable of forming, with the alkalies, soaps soluble in water, and which gave, upon analysis :—

Carbon,	0.7337
Hydrogen,	0.1214
Oxygen,	0.1649

We may remark that, in these different substances, the hydrogen and the carbon are always in the same proportion, of 1 to 2. I conclude from this that they are different oxides of the same carburet of hydrogen, CH^2.

Ann. des Mines.

A new method of working up Caoutchouc.—(*Ann. der Phar.*)—The use of ether, the oil of turpentine, the volatile oil obtained from caoutchouc, the balsam of copaiba, and the oil obtained in the manufacture of gas for illumination, has the inconvenience of being very expensive, and of producing a varnish, which dries with difficulty. For some time ammonia has been used with advantage. The gum elastic, cut into small pieces, is to be put into a vessel, covered with caustic ammonia, and left in this state for some months. The ammonia becomes brown, and the gum takes on a brilliant and silky appearance, like that of fresh nerve. The caoutchouc, thus swelled up, is still elastic, and has altogether, when drawn out, the appearance of fine silken fibres—but breaks more easily than the crude caoutchouc.

By treating the caoutchouc, swelled by ammonia, with the oil of tur-

pentine, it is easily changed by agitation into an emulsion, and in time swims upon the surface like cream upon milk; after this it acts like a varnish. But it requires much less of the oil of turpentine to dissolve it, than when it has not been softened by the ammonia. *Ann. des Mines.*

On Schweinfurt Green, by M. Ehrmann, (*Ann. der Pharm.*)—Triturate 100 parts of basic acetate of copper with sufficient water at 50°, to form a liquid pap; mix with this emulsion a solution of eight parts of arsenious acid in 100 of boiling water; the whole to be kept boiling. Sometimes it is necessary to add a little vinegar, that the color may be fine and in a crystalline state. The supernatant liquid is acid, and contains likewise some oxide of copper. This liquid may be employed with advantage in subsequent operations, to dissolve the arsenious acid. It likewise facilitates the solution of the acid in the water to add a little carbonate of potassa.

Schweinfurt green may also be obtained by mixing together two boiling solutions, the one of the neutral acetate of copper, and the other of arsenious acid. When thus prepared, it receives the name of *Vienna green.*

These two colors are identical, and are composed of—

Oxide of copper,	0.31243	4 at.
Arsenious acid,	0.58620	3 "
Acetic acid,	0.10135	1 "

Their formula is $\dot{C}uC^4H^6O^3+3\dot{C}u\,\ddot{\underline{As}}$.

This substance is insoluble in water; but the acids, the same as the acetic acid, dissolve by decomposing it. The alkalies likewise decompose it, and if boiled upon it, the copper is left in the state of protoxide, and an alkaline arsenite is formed. *Ann. des Mines.*

On the Hydrated Peroxide of Iron, as an Antidote for Arsenic, by Robert B. Hall, M. D., (Princess Anne County, August 6, 1838.)—The hydrated peroxide of iron has, for some time past, been engaging the attention of the medical world as an antidote for arsenious acid. Much contrariety of opinion exists upon the subject, and while many of the most prominent members of the medical corps exhibit a spirit of scepticism with regard to its anti-arsenical virtues, still, a host of names, " not unknown to fame," are disposed to consider its properties in this point as specifical. The object of this communication is to sum up, in a concise manner, the most positive testimony in favor of its properties as a counter-poison, which my limited opportunities have enabled me to collect, and at once submit it to the medical world, together with a few experiments of my own, in order that some of your numerous readers, who feel interested in the subject, may, by comparing experiments, or otherwise, incontrovertibly establish an important point in toxicology.

In the Bulletin Générale Thérapeutique, for December, 1834, MM. Soubeiran and Miguel, of Paris, have published their experiments, with the supposed antidote, upon the canine species. The acid was first given, with the view of testing the anti-arsenical properties, said to be inherent in the economy of the dog family. The administration of large doses of the poison produced copious vomiting, and in every instance the animals submitted to their experiments recovered, without any other pathological symptom; it therefore became necessary to tie the œsophagus after the introduction of the arsenious acid, to obviate vomiting; the consequence of this step was the uniform death of the dogs in from two to four hours. The third step in the experiments consisted in giving a certain portion of the poison, followed by twelve times its amount of the hydrated tritoxide of iron, and an immediate closure of the œsophagus by ligature,—life was prolonged to seventy-eight, eight-four and ninety-hours. It must be here remarked that tying the œsophagus is a fatal operation, and generally destroys life in from sixty to one hundred hours. Consequently the salutary effects of the iron cannot be doubted in these cases, for where the arsenic was given, and the ligature tied, *without* the administration of the antidote, the longest period of sufferance was four hours. Several other experiments were instituted to determine how long after the admission of arsenic into the system the antidote may be given with a reasonable hope of success; the results all tended to prove the value of the iron, and the experimenters emphatically conclude that it is a counter-poison where arsenious acid has been swallowed.

Drs. Borelli and Demaria, two physicians of Turin, have published in substance the following:—

Experiment 1.—Twelve grains of arsenious acid given to a dog; the œsophagus tied, but no peroxide of iron administered. Result, death in three hours.

Experiment 2.—Nine grains of arsenic given to a dog, and immediately after three ounces of hydrated tritoxide of iron, the œsophagus tied; seven hours afterwards the ligature was loosened to introduce another dose of the antidote. The animal lived ten days, and was then killed for a necroscopy.

Experiment 3.—Fourteen grains of the poison, given to a large dog, and the œsophagus tied; it was loosened half an hour afterwards to introduce one ounce of the iron. The dog perfectly recovered, and was killed some days subsequently, by a dose of arsenic administered without the antidote.

Conclusions.—Four and a half parts of the iron necessary to neutralise one of arsenious acid. The hydrated iron loses its virtue by age; if *fresh*, it is as certain an antidote to arsenious acid as albumen is to corrosive sublimate.

In the Journal de Médecine et de Chirurgie Pratique for September, 1835, M. Geoffroy, treated a hair-dresser, who had taken an ounce and a half of white oxide of arsenic. He gave ℥vi. ss. of hydrated peroxide of

iron, in divided doses. The patient recovered. *Conclusions*,—the iron an antidote; it also produces a brisk catharsis, independent of its counter-poison properties. The iron should be freshly prepared.

In the Journal des Connaisances Medico-chirurgicales for November, 1835, MM. Bineau and Majesté, of Saumur, attended five little girls, who had eaten of cake, containing arsenic, prepared for the purpose of destroying rats; from four to six ounces of iron was given to each child with the happiest results. *Conclusion*,—the hydrated peroxide of iron a certain antidote for arsenic.

Professor Von Specs, of Vienna, has recorded some experiments, in a German Journal, which have been transferred to the pages of "Bell's Library," for January, 1838. Results satisfactory.

In Professor Dunglison's "Medical Intelligencer," vol. 2, No. 1, Dr. Joseph E. Muse, of Maryland, has published his experiments with iron upon a dog. Result unsatisfactory—the animal drugged largely, but vomited in the early part of his experiment and recovered. *Conclusion*,—the animal preserved, not by the tritoxide of iron, but by the peculiar anti-arsenical properties resident in the animal economy of the dog.

Dr. Richard H. Thomas, of Baltimore, has published in "Dunglison's Intelligencer," vol. 2, No. 8, an account of a case in which he treated an individual who by mistake swallowed twenty grains of arsenic, with the hydrated iron, followed by magnesia. A perfect cure was effected. It is not positively proven that this is a genuine case of poisoning by arsenic, but from the facts connected with the case, there is every reason to believe that the arsenious acid had been swallowed.

I have collected some of the above cases from the "British and Foreign Medical Review," to which I would refer those who are interested for a more enlarged description of the numerous experiments. I have been unable to procure but one of the foreign journals to which I have referred (La Bulletin Générale de Thérapeutique), but I have no doubt that the translations given by Drs. Forbes and Conolly are faithful.

EXPERIMENTS BY THE AUTHOR.

Experiment 1st. Twenty grains of arsenious acid given in clear water to a large dog. One hour after, gastric distress; vomiting and perfect recovery.

Experiment 2d. Same dose given, and œsophagus tied; death in two hours and seven minutes.

Experiment 3d. Three and a half grains arsenic given to a small dog, œsophagus left untied; in two hours much derangement of stomach, but no emesis. Death occurred in four hours and forty-six minutes.

Experiment 4th. Twenty grains of arsenic given to a dog; œsophagus tied. One hour after, one ounce of the hydrated peroxide of iron, mixed with a half pint of water, was thrown up the rectum. Death in sixty-six hours.

Experiment 5th. Twenty grains given to a dog, followed by one ounce of the antidote; œsophagus tied; catharsis and recovery. *Conclusions*,—arsenious acid innocuous upon the economy of the dog, when given in doses sufficiently large to produce vomiting; if the poison be retained either by ligature or by doses too minute to excite emesis, it is certainly fatal. The hydrated iron *is* an antidote.

The antidote was procured after Bunsen's mode—℥i. of iron filings is thrown into ℥viii. of aqua regia, and heated gently in a glass vessel; after the iron dissolves, ℥xvi. of cold water are added, and the metal is precipitated by adding ℥iii. aq. ammoniæ. The whole is now agitated and filtered, and the powder dried in the shade for use.

Amer. Med. Intel.

Smoking of Stramonium as a remedy for Asthma, by G. G. Sigmond, M.D. &c.—The first legitimate introduction of the datura stramonium, as a remedy for asthma, and other pulmonary affections, is to be attributed to Dr. Sims, who very strongly recommended smoking the herb. It was in the year 1802, that General Gent, on his return from India, gave to that learned physician and accomplished botanist, a remedy which was used in the east as a specific for relieving the paroxysms of asthma, and told him that it was prepared from the roots of the wild, purple-flowered thorn-apple, the datura ferox. The roots, it appeared, were cut into slips, as soon as they were gathered; they were then exposed in the dry air, in the shade, until all moisture had completely evaporated; they were then beaten into fibres, very much resembling in appearance dry hemp. When the remedy was to be tried, these shreds were placed in the bulb of a pipe, either with or without tobacco, according as the individual had been previously accustomed to smoking or not, and then inhaled, after being kindled, in the usual form. This plan and mode of treatment had received the sanction of the highest medical authorities in India, and Dr. Anderson, physician-general at Madras, not only recommended it, but is said to have had recourse to it himself.

Dr. Sims, in one of the periodicals of that day, related a case in which he was induced to administer this remedy. The daughter of an eminent physician laboured under phthisis pulmonalis, combined with asthma, as it appeared to him, from the frequency of the paroxysms of difficulty of breathing, not usual in pure phthisis, at least in so early a stage of the disorder; with a view of alleviating these distressing paroxysms, he recommended a trial of the datura, as given to him by General Gent; the relief obtained was far beyond his expectation; and although the lady gradually sank under the incurable disease, yet she continued to experience throughout its progress, even to the last, the greatest comfort from its use. He then

recommended it to Mr. Toulmin, of Hackney, who had for several years suffered frequent paroxysms of asthma; he was much benefitted by it, and having exhausted all the stock given him by Dr. Sims, he determined on the suggestion of the Doctor, to supply its place with the datura stramonium, which he found equally serviceable. * * * * Dr. Bree, in a letter published in 1811, states that from the beginning of the year to the month of April, he had seen eighty-two patients who had smoked stramonium; those who had derived no permanent good effect were fifty-eight out of that number, the remaining twenty-four had been all of them more or less injured, and some of them destroyed, by the practice. Of the fifty-eight, eleven certainly were not in a state to try the remedy, and whether the others derived even temporary relief we are not told. He gives in the list of twenty-four, seven patients with phthisis, who evidently ascribe the natural course of the disease to the bad effects of the herb. He states an instance in which epilepsy occurred to a lady advanced in life, who had never before had any attack of the kind; he likewise adduces instances where the worst symptoms had rapidly supervened, but they were in constitutions highly debilitated, and in cases where the difficulty of breathing was the result of organic changes of the most important viscera, and where disease would, under any circumstances, have rapidly developed itself.

But an event occurred which naturally excited amongst the afflicted with this disease a very strong sensation, and overwhelmed with dismay the advocates of smoking stramonium. In the periodicals of the day will be found the remarkable history of the fate of a gentleman, deservedly esteemed and regarded, who, with a zeal highly praiseworthy, had materially assisted in the introduction of this, which he believed to be so valuable a remedy for an afflicting disorder. At that time, delicacy to the parties prevented the name of the individual, whose loss was so much deplored, from appearing; but, as time has worn away the necessity for such a feeling, and as the case has become one almost of medical history, I may state to you, that the gentleman whose name I have mentioned to you as the person who had brought with him the datura from Madras, and had given it to Dr. Sims, is the unfortunate subject of my present narration.

Sir George Gibbs, a physician of high character and talent, was suddenly called on to attend this gentleman at Bath. He found him in a comatose state; he appeared stunned, and his resolution was impaired; his head was reclining on a sofa; the pulse was scarcely perceptible, and the carotid arteries had little or no pulsation. It appeared, on inquiry, that the gentleman had smoked stramonium on the previous evening, in consequence of his having been much affected with shortness of breath; he had then exhibited symptoms of stupor. He arose the next morning, in a heavy, comatose state; a large blister was applied to the back, purgatives were administered, and a draught of camphor and scpills. On

the second day, the blister and the purgatives had produced their wonted effect, and the mental faculties were somewhat recovered. On the third day his recollection was much better, his pulse was perceptible, and some return of shortness of breath had occurred. On the fourth day he suddenly expired after dinner, either whilst sleeping, or immediately after waking. Dr. Parry, who was the nearest physician, was, at the spur of the moment, as he lived close by, sent for; but he found him dead, upon his arrival. The patient was of a full habit; he had been affected, about twelve months before, with wheezing and cough, from which he recovered, under the care of Dr. Gibbs, by ordinary treatment. At the commencement of this last attack, he had, without any consultation with his medical adviser, smoked largely of stramonium three or four times. * * * *

In pure spasmodic asthma, during the paroxysm, stramonium may be smoked, where there is not the slightest tendency to apoplexy, epilepsy or paralysis. Where dyspnœa is present, or constant difficulty of breathing, it is not to be recommended, nor where the embarrassment is the result of hydrothorax, or of diseased abdominal viscera. It is only to be pursued for a very short time, and the intervals between inspiration should be long; when the slightest giddiness comes on it must be immediately given up; the saliva should be swallowed. The patient should, if possible, avoid sleeping immediately after its use, and in preference should take moderate exercise. *Lancet.*

Action of Chloride of Sodium upon the metals, by M. Unges, (*Journ. fur part. Chem.*)—Sea salt of commerce in solution attacks iron, copper, zinc and lead; the last least of all. The action is strong when in contact with the air, or when boiling; it forms in soluble oxychlorides, and the liquid frequently contains a certain quantity of the metal in solution. Cast-iron is likewise attacked, but less than iron itself. *Ann. des Mines.*

2

3

4

Ergot Worm.

1 *Magnified.*
2 *Natural Size*
3 *Magnified*
4 *Natural Size*

T. S. Duval, Lith. Philad.ª